

FINAL
SITE HEALTH AND SAFETY PLAN
CHEMICAL OXIDATION TREATABILITY STUDIES, REMEDIAL UNITS 2, 4, 5, AND 6 AT PARCEL C
HUNTERS POINT SHIPYARD
SAN FRANCISCO, CALIFORNIA

Contract No. N62474-98-D-2076
Contract Task Order 0030

Document Control Number 1171
Revision 0

March 26, 2001

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Southwest Division
Naval Facilities Engineering Command
Environmental Division
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Submitted by:

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Approved by: _____

Mike Garant
IT Project Manager

Date: _____

3/23/01

Approved by: _____

for Fred Mlakar, CIH
IT Interim Program Certified Industrial Hygienist

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IT CORPORATION
A Member of The IT Group

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This Site Health and Safety Plan, for Contract Task Order 0030, has been prepared under the direction of the Program Certified Industrial Hygienist and has been reviewed by him.



for Fred Mlakar, CIH
IT Interim Program Certified Industrial Hygienist

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Acronyms and Abbreviations

ACGIH	American Conference of Governmental Industrial Hygiene
AHA	Activity Hazard Analysis
Cal-EPA	California Environmental Protection Agency
Cal-OSHA	California Department of Industrial Regulations, Division of Occupational Safety and Health Administration
CCR	California Code of Regulation
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CPR	cardiopulmonary resuscitation
CRZ	contamination reduction zone
DO	Delivery Order
DTSC	Department of Toxic Substances Control
EFA	Engineering Field Activity
EPA	U. S. Environmental Protection Agency
EZ	exclusion zone
eV	electron volts
FeSO ₄	ferrous sulfate
HCl	hydrochloric acid
H ₂ O ₂	hydrogen peroxide
HPS	Hunters Point Shipyard
H ₂ S	hydrogen sulfide
HSOP	Health and Safety Operating Procedure
IR	Installation Restoration
IT	IT Corporation
KMnO ₄	potassium permanganate
MSDS	Material Safety Data Sheet
NaHSO ₃	sodium bisulfite
NIOSH	National Institute for Occupational Safety and Health
OP	Operational Procedure
OSHA	Occupational Safety and Health Administration
PCE	perchloroethylene
PHSP	Program Health and Safety Plan
PPE	personal protective equipment
PS	Project Superintendent
SHSO	Site Health and Safety Officer
SHSP	Site Health and Safety Plan
SZ	Support Zone
TCA	trichloroethane

Acronyms and Abbreviations (continued)

TL	Technical Leader
TCE	trichloroethylene
Triple A	Triple A Machine Shop
USACE	U.S. Army Corps of Engineers
VC	Vinyl chloride

Policy Statement

It is the policy of IT Corporation (IT) to provide a safe and healthful work environment for all its employees. IT considers no phase of operations or administration to be of greater importance than injury and illness prevention. Safety takes precedence over expediency or shortcuts. At IT, we believe every accident and every injury is preventable. We will take every reasonable step to reduce the possibility of injury, illness, or accident.

This Site Health and Safety Plan (SHSP), in conjunction with the Engineering Field Activity (EFA)-West Remedial Action Contract II Program Health and Safety Plan (PHSP) (IT, 2000a), describes the procedures that must be followed during project operations. Operational changes that could affect the health or safety of personnel, the community, or the environment will not be made without the prior approval of the IT Program Certified Industrial Hygienist (CIH). The provisions of this SHSP are mandatory for all IT personnel, IT subcontractor personnel, Navy personnel, and visitors on this project.

Objective

The objective of this SHSP is to provide the guidelines for the contract task order (CTO) issued under contract with the Department of the Navy, EFA-West. The procedures and guidelines contained in this document are based on the best information available at the time of the plan's preparation. This SHSP describes the specific health and safety requirements and procedures to be used while conducting field work.

This site-specific SHSP, together with the PHSP and IT's *Health and Safety Policy and Policy and Procedures Manual* (IT, 2000b) comprise the company's Injury and Illness Prevention Plan and Code of Safe Work Practices. Each of these documents is required to be on site and available for immediate reference. Collectively, they contain the essential elements of the project site's Health and Safety Program. Section 1.0 of this SHSP describes the specific project site and the scope of work.

Site Health and Safety Plan Acknowledgement_____

I understand and agree to abide by the provisions detailed in the Program Health and Safety Plan (IT, 2000a) and this Site Health and Safety Plan for the activities described in the Project Work Plans (IT, 2000c). I understand that failure to comply with these provisions may lead to disciplinary action, which may include dismissal from the work contract.

[illegible]

1.0 Site Description and Scope of Work

1.1 Site and Facility Description

In 1940, the U.S. Government received title to the land at Hunters Point Shipyard (HPS) in San Francisco, California, and began developing it. From 1945 to 1974, the shipyard was predominantly used as a repair facility by the U.S. Department of the Navy (Navy). The Navy operated the shipyard as a carrier and ship repair facility through the late 1960s. HPS was deactivated in 1974 and remained relatively unused until 1976.

In 1976, the Navy leased 98 percent of HPS to a private ship repair company, the Triple A Machine Shop (Triple A). Triple A leased the property from July 1, 1976, to June 30, 1986. Triple A did not vacate the property until March 1987. During the lease period, Triple A repaired commercial and Navy vessels, using HPS facilities such as dry docks, machine shops, power plants, various offices, and warehouses. Triple A also subleased portions of the property to various other businesses. In 1986, the Navy resumed occupancy of HPS.

HPS is divided into five parcels (A, B, C, D, and E). Parcel C consists of about 79 acres, is the oldest portion of the shipyard, and was used almost exclusively for industrial purposes. Numerous industrial buildings, dry docks, wharfs, ship berths, and piers are located within the boundaries of Parcel C.

1.2 Scope of Work

Groundwater at several locations in Parcel C at HPS has been affected by various contaminants at concentrations exceeding regulatory standards. The contaminants present a potential threat to human health and the environment. A chemical oxidation treatability study is being conducted at HPS to determine whether chemical oxidation can reduce the concentrations of contaminants to acceptable remedial goals (IT Corporation, 2000c). Operational procedures for the chemical oxidation systems are presented in Appendix A.

1.3 Guidelines and Reference Materials

This Site Health and Safety Plan (SHSP) complies with the federal Occupational Safety and Health Administration (OSHA), California Department of Industrial Relations, Division of Occupational Safety and Health Administration (Cal-OSHA), U.S. Environmental Protection Agency (EPA), California Environmental Protection Agency (Cal-EPA), and California Department of Toxic Substances Control (DTSC) guidelines established in the documents listed in Section 12.0, "References."

The contents of this SHSP are consistent with, or supplemental to, the IT Corporation (IT) *Health and Safety Policies and Procedures Manual* (2000b). All applicable provisions of the policies will also be followed during this project. A copy of the *Health and Safety Policies and Procedures Manual* will be maintained at the job site by the Site Health and Safety Officer (SHSO). All IT employees and subcontractors must follow the facilities' fire, safety, and traffic regulations. All applicable federal, state, and local regulations, as well as the U.S. Army Corps of Engineers (USACE) *Safety and Health Requirements Manual EM385-1-1* (1996).

2.0 Responsibilities

All persons are responsible for their own health and safety, for completing tasks in a safe manner, and for reporting any unsafe acts or conditions to their supervisor or the Project Superintendent (PS). All persons on site are responsible for continuous adherence to health and safety procedures during the performance of any project work. In no case may work be performed in a manner that conflicts with the intent of, or the inherent safety precautions expressed in, this SHSP. After due warning, persons who violate procedures or work rules may be dismissed from the site, terminated, or have their contract revoked. Blatant disregard or repeated infractions of health and safety policies are grounds for disciplinary action up to, and including, dismissal and/or removal from the project.

All IT and subcontractor personnel are required to read and acknowledge their understanding of this SHSP. All project personnel are expected to abide by requirements of this SHSP and to cooperate with project management and safety representatives to ensure a safe and healthful work site. Site personnel are required to immediately report any of the following to the PS:

- Accidents and injuries, no matter how minor
- Expected or uncontrolled release of chemical substances
- Any sign or symptoms of chemical exposure
- Any unsafe or malfunctioning equipment
- Any changes in site conditions that may affect the safety of project personnel

Key project personnel are identified in Appendix B, "Emergency Phone Numbers," of this SHSP.

3.0 Project Hazard Analysis

This section describes the activity hazard analyses, lighting requirements, environmental hazards, biological hazards, and chemicals of concern for this project.

3.1 Activity Hazard Analysis

The activity hazard analysis (AHA) identifies potential safety, health, and environmental hazards and identifies measures to protect personnel, the community, and the environment. The AHA describes the sequence of work, the specific hazards anticipated, and the control measures that will be used to minimize or eliminate each hazard. Appendix C contains an AHA for each major task associated with this project and is supplemented by the following sections.

IT will perform various tasks associated with the remedial actions at HPS. The various remedial actions may include one or more of the following major tasks, which are also detailed by AHA (Appendix C):

- Mobilization/demobilization
- Delivery and storage of hazardous chemicals
- Chemical handling/mixing/injection
- Soil and water sampling
- Groundwater well drilling, installation, and monitoring
- Spill and emergency response
- Site restoration
- Decontamination of equipment
- Waste management

All employees have the right and duty to stop work when conditions are unsafe, or when established safety procedures are being disregarded. Whenever an employee determines that workplace conditions present an immediate uncontrolled risk of injury or illness, immediate resolution with the appropriate supervisor shall be sought. Should the supervisor be unable or unwilling to correct the unsafe conditions, the employee is authorized and required to issue a Stop Work Order in accordance with SH040, "Stop Work Authority" (IT, 2000). The specific activity or operation in question shall be discontinued until the issue is resolved.

3.2 *Illumination*

While work is in progress, offices, facilities, access ways, working areas, construction roads, and so on will be lit with at least the minimum light intensities specified in Table 7-1 of the *Safety and Health Requirements Manual EM385-1-1*, (USACE, 1996). In addition, compliance with Cal-OSHA 8 California Code of Regulations (CCR) 1523 will be adhered to during all phases of work activities.

3.3 *Environmental Hazards*

Poisonous or stinging insects, spiders, and/or snakes may be a concern for project personnel during sampling and other site activities. Disease vectors, such as ticks, may also be present. Poison oak or other noxious flora may be present on or near the site, and can cause severe skin irritation on contact. Physical hazards are also posed by native vegetation in the area, including thistles and other thorny weeds.

Site workers will inspect protected areas (e.g., boreholes, pits, and storage areas) before reaching into them or entering them in any way. Portable toilets have been a source of spider and snake bites. Stinging insects and their nests must be avoided wherever possible, and workers will wear long pants and, if necessary, long-sleeved shirts and gloves to protect them from insect bites and sharp or irritating plants.

3.4 *Bird Excrement*

Accumulation of bird excrement can pose a biological threat to site workers and visitors. A group of pulmonary disease and disorders exists, resulting from exposure to infected bird droppings. The inhalation of dust from infected droppings can result in one of these pulmonary infections. All site activities that might disturb bird excrement will be performed in Level C personal protective equipment (PPE) using P-100 respirator filters, at a minimum.

3.5 *Chemicals of Concern*

Chemicals of concern are presented in Tables 1 through 4. The State of California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65) requires notification of all persons who may be exposed to substances that have been determined by the State of California to cause cancer, birth defects, or other reproductive harm. Contaminants that may be present on site that have been determined by the State to cause cancer or reproductive harm are listed in Appendix D, "Proposition 65 Notice and Material Safety Data Sheets."

Material Safety Data Sheets (MSDSs) are provided in Appendix D for all materials that may be used in the course of operations.

3.6 Heat and Cold Stress

Adverse climatic conditions are important considerations in planning and conducting site operations. Extreme ambient temperatures can result in deleterious health effects ranging from transient heat fatigue, physical discomfort, reduced efficiency, personal illness, increased accident probability, etc., to serious illness or death. Heat stress is of particular concern when chemical protective garments are worn, since these garments prevent evaporative body cooling. Wearing personal protective equipment places employees at considerably higher risk of developing heat stress.

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses, regular monitoring and other preventive precautions are vital, and will be performed in accordance with HS 400, Heat Stress (IT, 2000).

Most cold related worker fatalities have resulted from failure to escape low air temperatures or from immersion in low temperature water. Employees should be protected from exposure to cold so that their deep core temperature does not fall below 96.8 degrees Fahrenheit. Core body temperatures below this level will likely result in reduced mental alertness, reduction in rational decision making, or loss of consciousness with the threat of fatal consequences. Any cold related work activities shall be performed in accordance with HS 401, Cold Stress (IT, 2000).

4.0 Buddy System

Project staffing during hazardous waste operations will meet the requirements and intent of the “buddy system,” which states that at least two persons are required to be at the work area, or exclusion zone (EZ), when risk of worker contamination or serious injury may exist. Respiratory protection, when worn, will always require that the buddy system be observed (for air-purifying respirators as well as supplied-air respirators).

5.0 Personal Protective Equipment

The required level of protection is specific to the activity being conducted. The initial levels of PPE are presented in Table 6. Additional details concerning task-specific PPE are included in the activity hazard analyses (Appendix C), operational procedures (Appendix A), and Program Health and Safety Plan.

As site activities progress, levels of PPE are subject to change or to modification. Upgrading of PPE can occur when action levels are exceeded or whenever the need arises to protect the safety and health of site personnel. Levels of PPE for a specific task will not be downgraded without prior approval from the Certified Industrial Hygienist (CIH).

No work will be permitted in Level B PPE without the authorization and concurrence of the Program CIH. No work will be permitted in Level A PPE without the authorization and concurrence of the Program CIH and the Vice President of Health and Safety.

PPE levels upgrades or downgrades are customarily verbally communicated between the Program CIH and the SHSO and are based on the results of air sampling data.

The following text defines PPE Levels.

Level B protection is required when airborne concentrations of hazardous materials exceed or are expected to exceed twice the OSHA PEL in confined spaces. Level B protection will not be used on any project without contacting the Program CIH for an addendum to the SHSP. The equipment listed for Level C protection will be used for Level B protection except a full-face, pressure demand, supplied air respirator, either self-contained or with an airline with an egress pottle will be substituted for the air-purifying respirator worn in Level C.

Use of Level A protection is not anticipated during any project activities. Should Level A protection be necessary, the Program CIH will be contacted.

Level C denotes the following, at a minimum:

- Half-face or full-face APR with NIOSH/Mine Safety and Health Administration (MSHA)-approved cartridges (full-face is required if eye irritation is encountered)
- Combination filter/cartridge providing protection against the following:

- Not more than 1,000 parts per million (ppm) organic vapors, chlorine, chlorine dioxide, hydrogen chloride, sulfur dioxide, and escape only from hydrogen sulfide
- Dusts, fumes, and mists having a TWA less than 0.05 milligrams per cubic meter (mg/m³)
- Asbestos-containing dusts and mists
- Radionuclides
- Cartridges approved for the specific contaminants (if the cartridge above is not appropriate)
- Surgical scrubs*
- Steel-toed PVC* boots-if liquids encountered, ANSI approved
- Tyvek* coveralls with hoods and elastic wrists and ankles (poly-coated* when there is a potential for contaminated water contact)
- Leather-palmed gloves (if no contact with material)
- Latex or Nitrile gloves (inner) – if liquids encountered
- Nitrile* gloves (outer)-if liquids encountered
- Hearing protection (if necessary) with 25 dBA or greater protection
- Hard-hat, ANSI-approved (western style “cowboy” hard hats are not permitted on site)
- Safety glasses with side shields, ANSI-approved, if full-face APR is not worn
- Splash shield (if necessary) if full-faced APR is not worn. Must be worn with safety glasses, ANSI-approved *or constructed of other materials as appropriate

Level D denotes the following, at a minimum:

- Standard work uniform or coveralls
- Steel-toed work boots, ANSI-approved
(steel-toed “athletic style” shoes are not permitted on site)
- Safety glasses with side shields, ANSI-approved
- Hearing protection (if necessary) providing 25 dBA or greater protection
- Splash shield (if necessary)

Modified Level D denotes the following, at a minimum:

- Standard work uniform or coveralls
- Steel-toed work boots, ANSI-approved
(steel-toed “athletic style” shoes are not permitted on site)
- Steel-toed PVC boots-if liquids encountered, ANSI-approved
(may be constructed of other materials as appropriate)
- Tyvek-type coveralls (in lieu of standard coveralls)
- Leather-palmed gloves
- Latex or Nitrile gloves (inner)—if liquids encountered
- Nitrile gloves (outer)—if liquids encountered
- (May be constructed of other materials as appropriate)
- Hearing protection (if necessary) providing 25 dBA or greater protection
- Splash shield for pressure washing activities
- Hard-hat, ANSI-approved (western style “cowboy” hard hats are not permitted on site)
- Safety glasses with side shields, ANSI-approved
- Raingear or poly-coated Tyvek for pressure washing activities
(may be constructed of other materials as appropriate)

Metatarsal guards (for pressure washing activities)

6.0 Site Control

This section describes the controls that will be used to ensure that personnel have the proper training and follow proper procedures for access to work areas.

6.1 Site Access Control

This project requires that access to the site be controlled to protect both the worker and the public. Controlled access may require fences, barricades, traffic control devices, use of flaggers, caution tape, and other means to keep the site secure and to provide a visual barrier to help keep the curious or unaware public from entering the site.

For work at sites that include hazardous waste operations, the work area will be divided into three work zones based on the exposure to contaminated materials or anticipated hazards associated with the work: an exclusion zone (EZ), a contamination reduction zone (CRZ), and a support zone (SZ).

The exclusion zone will be marked with caution tape and/or barricades. Chemical mixing and injection equipment-specific training will be required for entry to the exclusion zone during the tasks involving chemical mixing and injection. Temporary workers, such as electricians, may not enter the exclusion zone if operations are occurring or equipment has not been decontaminated.

The contamination reduction zone will be marked with cones at the entry/exit of the EZ. This area will contain decontamination equipment and safety supplies.

The support zone will be maintained around the general vicinity of the exclusion zone perimeter. The site safety professional/technician shall maintain a daily log of all personnel in the SZ.

6.2 Hazard Briefing

No person will be allowed on the site during site operations without first being given a site hazard briefing. In general, the briefing will consist of a review of this SHSP and the tailgate safety meeting. All persons on the site, including visitors, must sign the SHSP Acknowledgement Sheet (page ix) and the tailgate safety meeting form. The tailgate safety meeting will be held daily before site activities begin.

6.3 *Entry and Visitor Logs*

A site entry/exit log will be maintained by the HSO or designee with names of all personnel who enter the CRZ. A site visitor log will be maintained by the HSO or his/her designee for all personnel in the SZ on a daily basis.

7.0 Decontamination

In general, everything that enters the EZ must either be decontaminated or properly discarded upon exit from an EZ. All personnel must enter and exit an EZ through a CRZ. Before movement from an EZ, contaminated equipment will be decontaminated and then inspected by the SHSO before it is moved into the support zone. This inspection will be noted in the daily safety log.

7.1 Procedures for Equipment Decontamination

Any item or vehicles taken into an EZ must be assumed to be contaminated and must be carefully inspected and/or decontaminated before leaving that particular EZ. A visual inspection of the frame and tires of all vehicles and equipment leaving an EZ will be completed. For a vehicle or equipment to pass inspection, it must be in broom-clean condition, water washed, and free of loose dirt or sludge material on tailgates, axles, wheels, buckets, and so on.

A steam pressure washer will be on site so that any vehicles or equipment can be steam cleaned if the Program CIH or SHSO deem necessary. All pressure-washing activities will be conducted in accordance with Health and Safety Operating Procedure (HSOP) 303, "Pressurized Water Cleaning and Cutting Equipment" (IT, 2001).

The equipment decontamination area will be used to remove soil from all equipment leaving the work area. Decontamination procedures are covered in detail in Appendix C. A special "clean area" will be used by personnel who must come in contact with equipment during vehicle maintenance and repair. All equipment requiring maintenance or repair will be staged in a CRZ before servicing.

Personnel assigned to vehicle decontamination will wear the protective equipment, clothing, and respiratory equipment consistent with this SHSP. Seats and flooring in equipment and vehicles that are to be used in the EZ will be covered with disposable polyethylene to the greatest extent possible.

7.2 Personnel Decontamination

Personnel decontamination will be established by IT on site to ensure that personnel maintain a high degree of personal hygiene and to minimize the possibility of exposure to chemical hazards.

A personnel decontamination area will be established in the CRZ immediately outside the EZ to facilitate decontamination and PPE removal. All personnel exiting the EZ will pass through the decontamination area and remove any contamination.

Personnel are required to wash hands, face, and other exposed skin areas before leaving the CRZ for breaks or lunch. With the exception of work in the SZ, no disposable work clothing, shoes, or boots will be worn or carried out of the CRZ. Boots and respirators will be decontaminated before being taken into the SZ.

8.0 Site Monitoring

8.1 Air Monitoring

Personal and ambient air monitoring is essential to ensure that all field personnel are adequately protected from airborne contaminants. The action levels specified in Table 7 have been established based on contaminants of concern, the potential route of entry, duration of exposure levels established by OSHA as well as guidelines published by the American Conference of Governmental Industrial Hygiene (ACGIH) and National Institute for Occupational Safety and Health (NIOSH). These action levels will vary from project to project.

8.1.1 Action Levels

Specific action levels to be observed for selection of PPE during site operations are identified in Table 7. To ensure the ability to detect the presence of dichloroethanes, photo-ionization detectors will use an 11.2-electron volt (eV) lamp.

8.1.2 Real-Time Air Monitoring Frequency and Locations

Air monitoring frequency and location requirements are identified on Table 8.

8.2 Monitoring of Physical Hazards

Monitoring physical hazards such as noise, temperature, wind speed, and dust may be conducted by the SHSO under the direction of the Program CIH. The specific requirements for noise monitoring and evaluating heat and cold stress are discussed in detail in the Program Health and Safety Plan (IT, 2000a) as well as in the *IT Health and Safety Policies and Procedures Manual* (IT, 2000b).

9.0 Employee Training

This section describes the training requirements and communication practices that will be used for this project.

9.1 Tailgate Safety Meetings

Before the start of the project, all personnel will participate in an initial tailgate safety meeting. During the initial tailgate safety meeting, this SHSP will be discussed. The PS will ensure that the anticipated site hazards are summarized and explained to all personnel, and that those personnel are aware of the precautions they must take to minimize their exposure to the hazards. Tailgate safety meetings will be held at the start of each work shift. All new employees must attend a site health and safety orientation. Attendance records and meeting notes will be maintained with the project file.

9.2 Hazardous Waste Training

All personnel entering the EZ or CRZ will have completed at least 40 hours of training related to hazardous waste operations and emergency response (HAZWOPER) as required by 29 Code of Federal Regulations (CFR) 1910.120 and by 8 California Code of Regulations (CCR) 5192. Personnel may also be required to complete the following job-specific training:

- 40 hours of training for all personnel
- 3 days field experience
- Current 8-hour refresher (within the last 12 months)
- 8-hour supervisory training (supervisors)

The requirement for HAZWOPER training may be waived if all of the following conditions can be demonstrated:

- Remediation of hazardous wastes has been completed.
- The potential for exposures to hazardous wastes has been eliminated.
- Only “clean” activities remain.

Such waiver will require specific approval by the Program CIH.

9.3 Hazard Communication

All personnel performing field activities will receive basic hazard communication training. This training involves a review of the IT written hazard communication program (IT Health and

Safety Procedure HS 060, Hazard Communication Program [IT, 2000b]), MSDSs for chemicals used on site, container labeling, and chemical health hazards. MSDSs will be obtained for all materials purchased or brought on site that require an MSDS, and the MSDS will be kept on site with this SHSP.

9.4 Site-Specific Training

Site-specific training will be accomplished through an initial review of this SHSP by the SHSO, attending the site-specific orientation conducted by the Technical Lead and through the tailgate safety meetings. Attendance for such training will be tracked by obtaining signatures of all attendees and will be documented in the project files. Only personnel receiving all the above-referenced training will be allowed to work on this project.

Chemical mixing and injection equipment-specific training will be required for entry into the EZ. This training will be conducted by the Technical Lead and will include, but not be limited to, a review of Appendices A and C of this document.

Only appropriately trained personnel may operate equipment. This includes equipment such as forklifts, backhoes and other earthmoving equipment.

9.5 First Aid and Cardiopulmonary Resuscitation

At least two employees current and certified in first aid and cardiopulmonary resuscitation (CPR) will be assigned to the project, and at least one of these will be on the site whenever operations are ongoing. Where multiple work groups are dispersed throughout a project site, more than two employees will be current and certified in first aid and CPR. The extent of coverage will be determined relative to the number of employee groups. First-aid-trained personnel will also be trained in bloodborne pathogen hazards. IT requires refresher training in first aid and CPR for such individuals to maintain a current certificate. The SHSO will be current and certified in first aid and CPR training.

10.0 Medical Surveillance Program

IT uses the services of Health Resources for medical surveillance requirements for all projects. All personnel on site working within the CRZ or EZ will have completed an occupational medical monitoring physical within the last 12 months. Such individuals will also have written clearance in their records to work on hazardous waste sites and to wear a respirator if required by the job. Health Resources (below) will review all medical examinations and will be available for medical consultation on an as-needed basis.

Health Resources

600 West Cummings Park, Suite 3400

Woburn, MA 01801

1-800-350-4511

11.0 Emergency Response Plan and Contingency Procedures

Site personnel must be prepared to respond and act quickly in the event of an emergency. Emergency preparedness and response procedures will help protect site workers and the surrounding environment. Preplanning measures will include employee training, fire and explosion prevention and protection, chemical spill and discharge prevention and protection, and safe work practices to avoid personal injury or exposure. An adequate number of emergency eyewash and/or shower units will be strategically placed to allow immediate access in the event of an emergency. These activities will be discussed both the site-specific orientation and in the daily tailgate safety meetings. Procedures for responding to emergencies at the site are presented in Appendix H.

11.1 Project Technical Leader

At all times during scheduled work activities, the Project Technical Leader (TL), or designee, will be present on the site. The TL is responsible for ensuring the quality and completeness of the technical aspects of the project. Additionally, the TL is responsible for overseeing emergency spill response and evaluating the completeness and appropriateness of the response given conditions encountered in the field.

11.2 Project Superintendent

A designated PS will be present on the site during all scheduled work activities. The PS is ultimately responsible for maintaining a current chemical inventory list (see Table 10) and MSDS sheets for all hazardous materials stored on site. This list will be used if emergency response or contingency procedures are implemented. Depending on the circumstances, and time permitting, the PS will review proposed response actions with both the Task Manager and the SHSO prior to implementation. This individual is responsible for implementing any emergency response or contingency procedures.

11.3 Site Health and Safety Officer

The SHSO is responsible for implementing, communicating, and enforcing health and safety policies and procedures during the course of the project. The SHSO will also help evaluate health and safety concerns relative to environmental releases and emergency response actions. In the event of an injury, notify the Concord Health and Safety Administrator, who will report the medical incident to the Health Resources case manager. The SHSO will document any emergency response actions and medical incidents in the daily log.

11.4 List of Emergency Contacts and Notification

The TL, PS, and SHSO will be notified immediately in the event of an emergency. The PS will immediately evaluate the incident and, if necessary, notify the HPS Fire Department. Telephone numbers for emergency contact personnel are listed in Appendix B.

11.5 Fire Control

In the event of a fire or explosion, or imminent danger of fire or explosion, all activities will halt, and the HPS Fire Department will be notified immediately. If it is safe to do so, site personnel may use fire-extinguishing equipment available on site.

The following measures will be implemented during site activities to minimize the risk of fire and/or explosion:

- Smoking will be prohibited on site except in designated smoking areas.
- Good housekeeping procedures will be required on site.
- Material storage methods will comply with manufacturers' recommendations.
- Flammable liquids will be stored in approved containers only.
- All storage, handling, or use of flammable and combustible materials will be conducted by trained personnel only.
- Entry and exit pathways will be kept clear of debris or obstacles.
- Work areas will be cleared of excess vegetation and obstructions.
- Hot Work permits will be required on site.

11.6 Site Evacuation Procedures

The authority to order personnel to evacuate the work area rests with the PS and SHSO. If site evacuation is required, a continuous, uninterrupted air horn or vehicle horn will be sounded for approximately ten seconds. Personnel working on the site will immediately make their way to the muster point for a "head count."

The EZ location evacuation routes and emergency equipment locations are included in the Site Evacuation Map, presented in Appendix F. This map will be posted at each entrance to the EZ/work area. During an emergency, the evacuation routes noted on the site map (Appendix F) will be followed. If conditions such as wind direction or physical hazards do not allow access to the prescribed evacuation routes, personnel will evacuate by the safest route available.

11.7 Spills or Leaks

IT will maintain the following equipment and materials in the CRZ (see Figure 1 and Appendix E) for use during spill response activities:

- Absorbent pads
- Granular absorbent material
- Polyethylene sheeting
- Plastic bags
- 55-gallon drums
- Hach spectrophotometer
- Sodium bicarbonate
- Sodium bisulfite powder
- Small spray bottle (containing 1/3 vinegar, 1/3 hydrogen peroxide, and 1/3 tap water)
- Hudson sprayer with neutralization solution (consisting of a 10 percent sodium bisulfite solution)
- Shovels and assorted hand tools

Small-quantity spills of less than 1 gallon of liquid material will be neutralized locally using either a 10 percent bisulfite solution or a mixture of vinegar, hydrogen peroxide, and water solution. Notification of the PS and TL may occur after containment and neutralization of the spill occurs.

Large-quantity spills of more than 1 gallon of liquid material will follow the specific emergency response procedures in Appendix H. Prior or concurrent notification of the PS and TL will be initiated when feasible.

11.8 Emergency Medical Response

In the event of severe physical or chemical injury, HPS Fire Department personnel will be summoned for emergency medical treatment and ambulance service. The HPS Fire Department emergency medical responders will be used to provide care to severely injured personnel. Once an initial assessment is made by the emergency medical technicians, the decision to use ground or air transportation for the victims will be made. MSDS sheets may be removed from site log for use by emergency services.

Minor injuries will be treated on site by qualified first aid and CPR providers and if additional treatment beyond first aid is required, the injured personnel will be transported to the designated hospital. Transportation routes and maps will be placed in each site vehicle before site activities begin. Maps delineating routes from the sites to applicable hospitals are included in Appendix G.

11.9 Personal Exposure or Injury

In the event of personal exposure to contaminants, the following general guidelines will be adhered to:

- Contact/absorption
 - Flush contaminants from the victim's skin using copious amounts of potable water for at least 20 minutes.
 - Start flushing while removing contaminated clothing.
 - If irritation persists, repeat flushing.
 - Assess condition of the victim and arrange for transport to a medical center, if necessary.
 - Do not transport victim unless the recommended flushing period is completed or flushing can be continued during transport.
- Inhalation
 - Move the victim **IMMEDIATELY** to an area where fresh air is available.
 - Decontaminate the victim, if necessary.
 - Administer artificial respiration, if necessary.
 - Assess condition of the individual and arrange for transport to a medical center, if necessary.
- Ingestion
 - Contact the local poison control center **IMMEDIATELY**, if necessary.
 - Decontaminate the victim, if necessary.
 - Transport the victim to a medical facility, if necessary.

11.10 List of Emergency Contacts and Notifications

The SSHO will immediately evaluate the incident and, if necessary, notify emergency support services. If not previously notified, the Project Manager and location contact will be advised of the situation. Telephone numbers for emergency personnel are listed in Appendix B. This list will be maintained with current contacts, and telephone lists will be kept along with other emergency phone numbers in each site vehicle.

Information provided to the notified person will include the nature of the incident and the exact location and suspended materials involved. Information regarding the incident reported to the emergency operator includes the following:

- Name and telephone number of the individual reporting the incident
- Location and type of incident
- Nature of the incident (fire, explosion, spill, or release) and substances involved
- Number and nature of medical injuries
- Movement or direction of spill, vapor, or smoke
- Response actions currently in progress
- Estimate of quantity of any released materials
- Status of incident

Other pertinent information such as chemical name, chemical abstract number, applicable reportable quantity, known or anticipated impacts to public health or the environment, known or anticipated health risks associated with the release and medical recommendations will also be reported when appropriate.

12.0 References

California Occupational Safety and Health Administration, Construction and General Industry Safety Orders, Title 8 California Code of Regulations, including Section 5192 "*Hazardous Waste Operations and Emergency Response*", California.

IT Corporation, 2001 Health and Safety Operating Procedure HS 060, "*Hazard Communication Program*."

IT Corporation, 2001, Health and Safety Operating Procedure 303, "*Pressurized Water Cleaning and Cutting Equipment*."

IT Corporation, 2000a, *Engineering Field Activity West Remedial Action Contract II Program Health and Safety Plan*.

IT Corporation, 2000b, Health and Safety Policy and Procedures Manual.

IT Corporation, 2000c, *Final Chemical Oxidation Treatability Studies Work Plan for Remedial Units 2, 4, 5, and 6, Hunters Point Shipyard, San Francisco, California*.

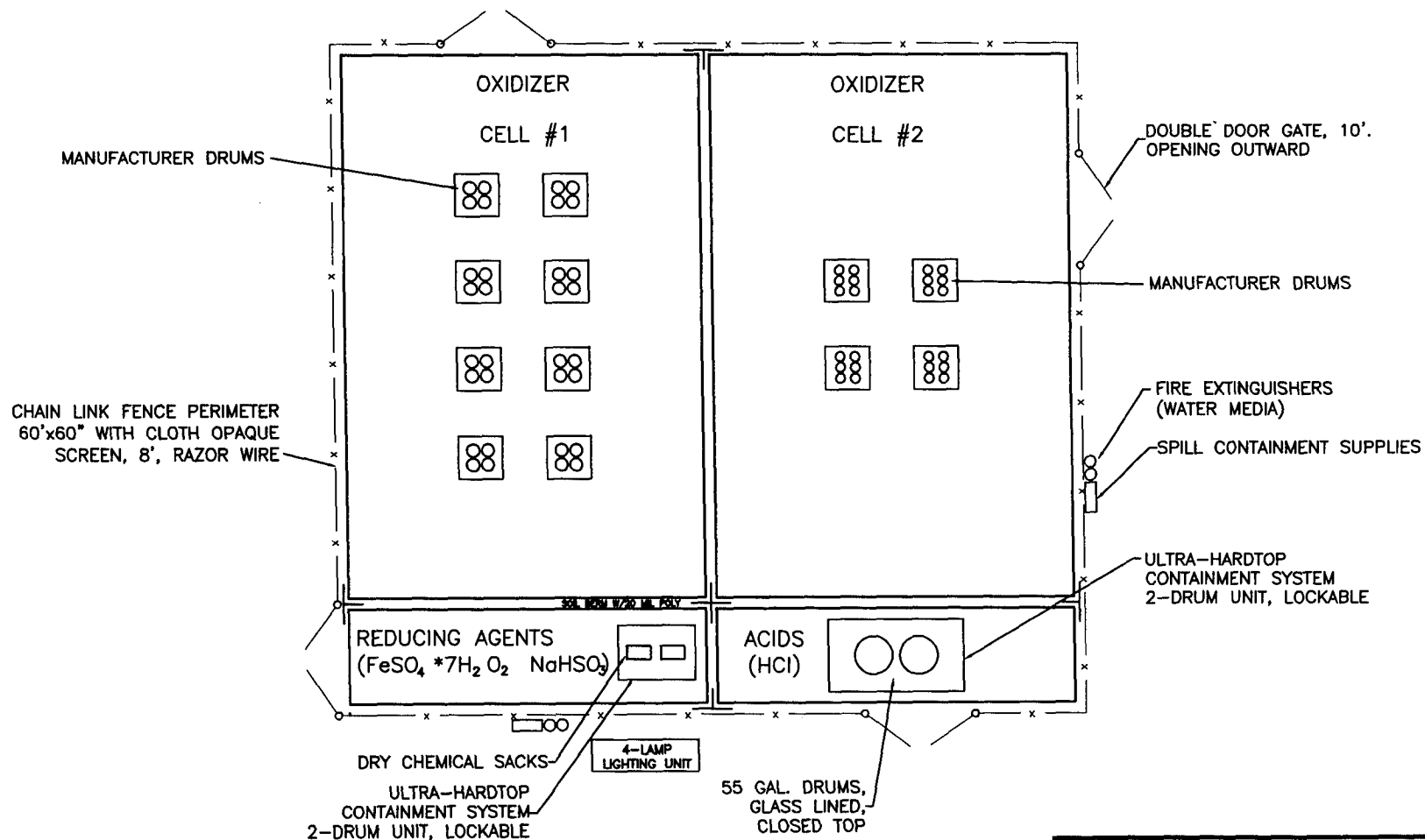
Department of Health and Human Services, National Institute of Occupational Health and Safety, U. S. Environmental Protection Agency, and U. S. Coast Guard Publication No. 86-116, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*.

Title 29 of the Code of Federal Regulations, Parts 1910 and 1926 including Part 1910.120/1926.65 which are specific to hazardous waste operations and emergency response for general industry and construction, respectively.

U.S. Army Corps of Engineers, 1996, *Health and Safety Requirements Manual, EM385.1*. September.

FIGURES

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	---	Concord	SCHAEFFER 3-23-01	<i>Drum</i> 010323	<i>1/1/01</i> 3/23/01	819828-A6




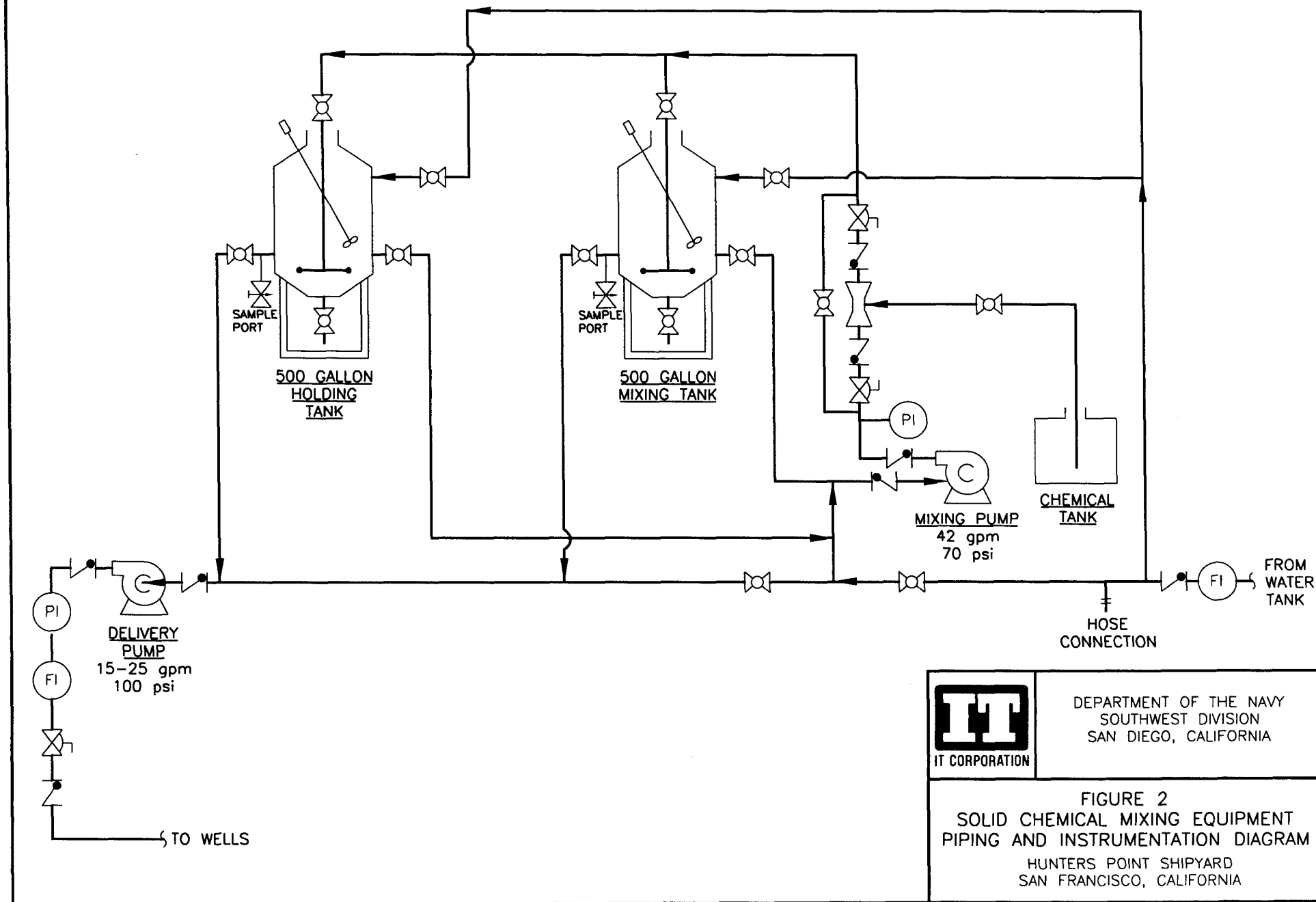
 ITT CORPORATION	HUNTERS POINT CONTRACT TASK ORDER #030 DEPARTMENT OF THE NAVY ENGINEERING FIELD ACTIVITIES-WEST
	<p>FIGURE 1</p> <p>CHEMICAL STORAGE AREA</p>

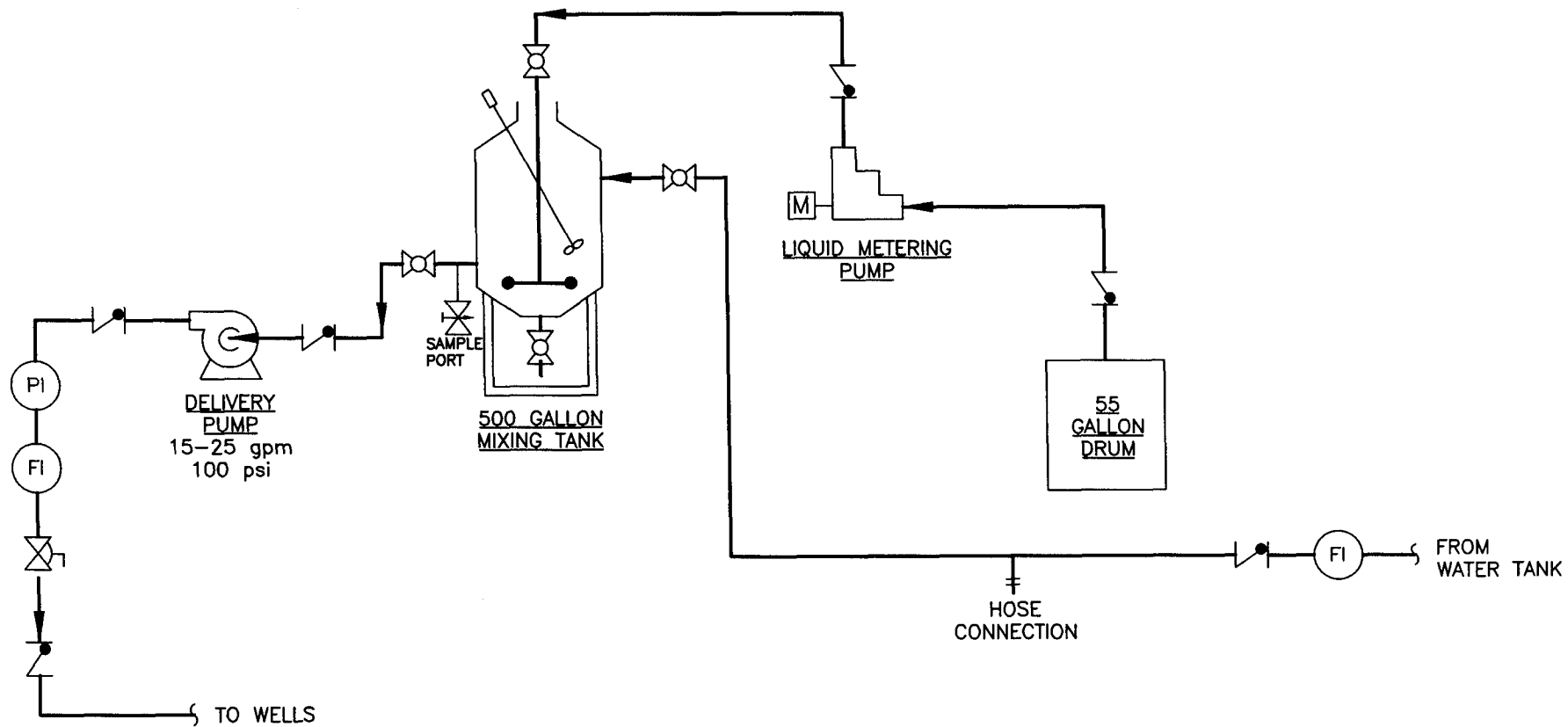
IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	---	Concord	BJ	01/08/01	<i>Handwritten signature</i>	819828-A2



DEPARTMENT OF THE NAVY
SOUTHWEST DIVISION
SAN DIEGO, CALIFORNIA

FIGURE 2
SOLID CHEMICAL MIXING EQUIPMENT
PIPING AND INSTRUMENTATION DIAGRAM
HUNTERS POINT SHIPYARD
SAN FRANCISCO, CALIFORNIA

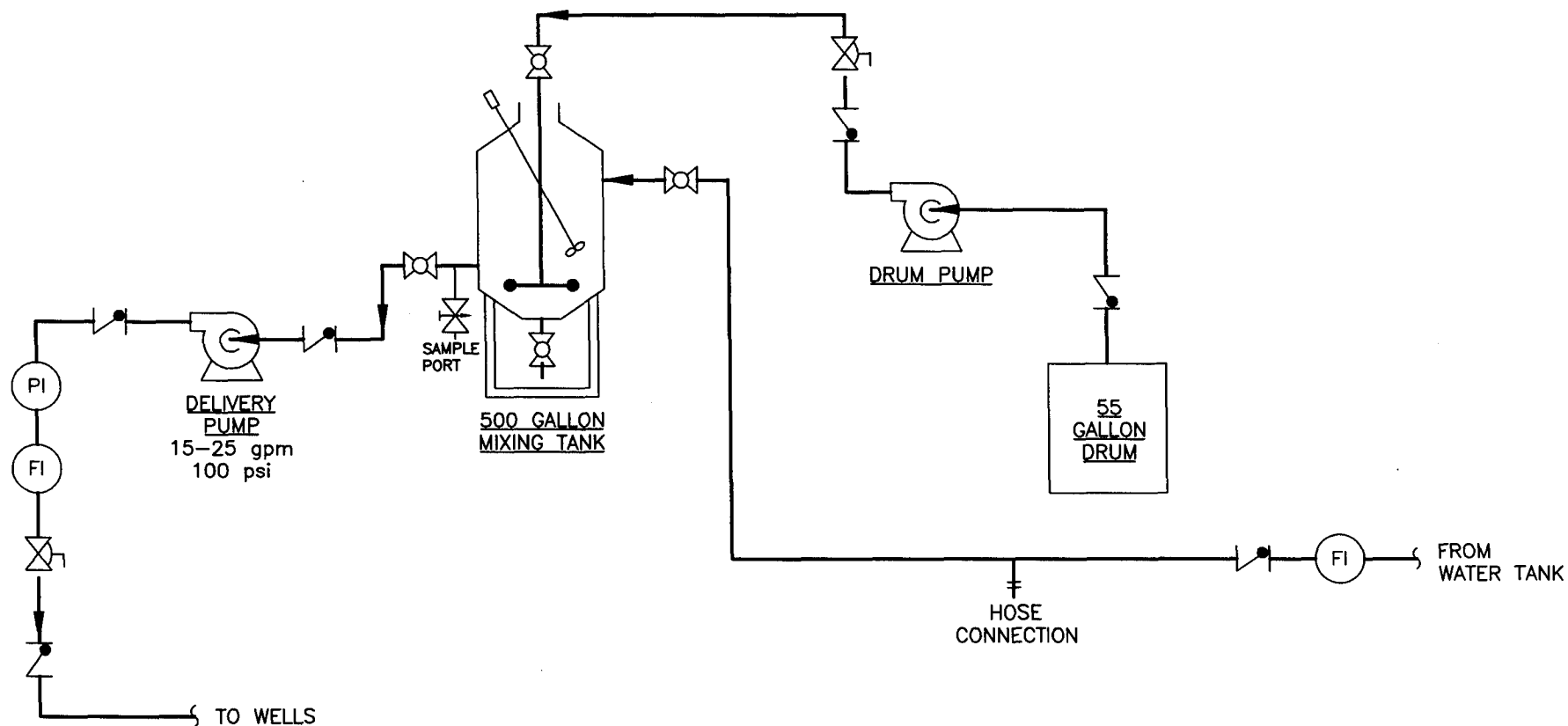
IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	---	Concord	BJ 01/08/01	B. V. M. 3/23/01	<i>[Signature]</i> 3/23/01	819828-A3



DEPARTMENT OF THE NAVY
SOUTHWEST DIVISION
SAN DIEGO, CALIFORNIA

FIGURE 3
CONCENTRATED LIQUID
MIXING EQUIPMENT
PIPING AND INSTRUMENTATION DIAGRAM
HUNTERS POINT SHIPYARD
SAN FRANCISCO, CALIFORNIA

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	---	Concord	BJ 01/08/01	-RUCM 3/23/01	<i>[Signature]</i> 3/23/01	819828-A1



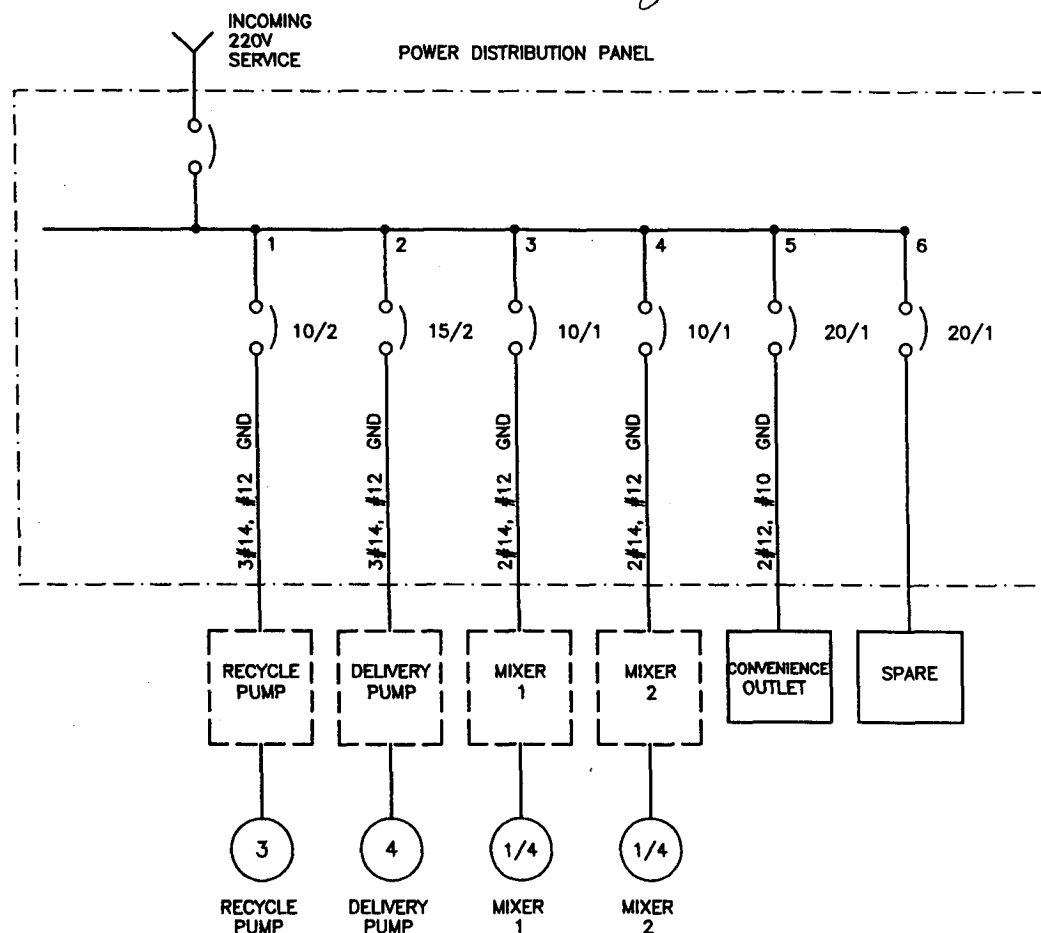
DEPARTMENT OF THE NAVY
SOUTHWEST DIVISION
SAN DIEGO, CALIFORNIA

FIGURE 4
DILUTE LIQUID MIXING EQUIPMENT
PIPING AND INSTRUMENTATION DIAGRAM
HUNTERS POINT SHIPYARD
SAN FRANCISCO, CALIFORNIA

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
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POWER DISTRIBUTION PANEL

POWER DISTRIBUTION PANEL							
CIRCUIT NUMBER	BREAKER TRIP	LOAD DESCRIPTION	LOAD WATTS	PHASE	LOAD WATTS	LOAD DESCRIPTION	BREAKER TRIP
1	10	RECYCLE PUMP	1800	A	2100	DELIVERY PUMP	15
3	10	MIXER 1	280	C	280	MIXER 2	10
5	20	CONVENIENCE OUTLET		A		SPARE	20



SINGLE LINE DIAGRAM



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FIGURE 5
ONE-LINE ELECTRICAL DIAGRAM
FOR SOLID CHEMICAL
MIXING EQUIPMENT
HUNTERS POINT SHIPYARD
SAN FRANCISCO, CALIFORNIA

TABLES

Table 1
Known Concentrations in Water in Parcel C

Chemical	Maximum Concentration (mg/L) Water
Chlorobenzene	0.33
1,2-Dichlorobenzene	3.5
1,4-Dichlorobenzene	0.76
1,2- Dichloroethane	150
1,1- Dichloroethene	0.007
1,2-Dichloropropane	0.35
Cis-1,2-Dichloroethylene	58
Heptachlor Epoxide	0.00003
Hexachloroethane	0.53
Methyl Chloride	0.19
Pentachlorophenol	6.1
1,1,2,2-Tetrachloroethane	0.006
Tetrachloroethylene	72
Trans-1,2-Dichloroethylene	1.8
1,2,3-Trichlorobenzene	0.20
Trichloroethylene	0.70
Vinyl Chloride	3.6

mg/kg denotes milligrams per kilogram

mg/L denotes milligrams per liter

Table 2
Hazardous and Toxic Materials in Soil and Groundwater for Parcel C

Contaminant (Synonym)	Physical Description	Chemical and Physical Properties	Incompatibilities	Target Organs	Symptoms of Exposure
Cis 1,2 – Dichloroethylene	Colorless liquid with a slightly acidic chloroform like odor	MW: 97 BP: 118° - 140°F MP: N/A VP: 180 - 265 mm Sol: 0.04% FP: 36 - 39°F LEL: 5.6% UEL: 12.8% IP: 9.65 eV	Strong oxidizers, strong alkalis, potassium hydroxide, copper	Eyes, respiratory system, CNS	Irritated eyes, respiratory system; CNS depression
Heptachlor Epoxide (Heptachlor used as surrogate chemical)	White sand-like material with camphor-like odor	MW: 373.35 BP: 293°F MP: 95 to 96°C VP: 3E-4 mm Hg Sol: Insoluble in Water FP: N/A LEL: N/A UEL: N/A IP: N/A	Iron, rust	Liver, CNS	Tremors, convulsion, excitement, spasticity, change in motor activity, aggression
Hexachloroethane	Colorless crystals with a camphor-like odor	MW: 236.7 BP: Sublimes MP: 368°F VP: 0.2 mm Sol: 0.005% FP: N/A LEL: N/A UEL: N/A IP: 11.22 eV	Alkalis metals such as zinc, cadmium, aluminum, hot iron, and mercury	Eyes, skin, respiratory system, kidneys	Irritation of eyes, skin, mucous membrane

Table 2 (Continued)
Hazardous and Toxic Materials in Soil and Groundwater for Parcel C

Contaminant (Synonym)	Physical Description	Chemical and Physical Properties	Incompatibilities	Target Organs	Symptoms of Exposure
1,1,2,2 – Tetrachloroethane	Colorless to pale yellow solid with an aromatic odor	MW: 265.9 BP: 599 - 680°F MP: 360°F VP: <1 mm Sol: Insoluble FP: 410°F LEL: N/A UEL: N/A IP: N/A	Strong oxidizers	Liver, skin, CNS	Acne from dermatitis, headache, fatigue, anorexia, vertigo, jaundice (liver ingestion)
Trans 1,2 – Dichloroethylene	Colorless liquid with a slightly acidic chloroform like odor	MW: 97 BP: 118 - 140°F MP: N/A VP: 180 - 265 mm Sol: 0.04% FP: 36 - 39°F LEL: 5.6% UEL: 12.8% IP: 9.65 eV	Strong oxidizers, strong alkalis, potassium hydroxide, copper	Eyes, respiratory system, CNS	Irritated eyes, respiratory system; CNS depression
1,2,3 – Trichlorobenzene (1,2,4-Trichlorobenzene used as surrogate)	Clear, nearly colorless liquid with aromatic odor	MW: 181.45 BP: 213°C (415°F) MP: 17°C (63°F) VP: N/A Sol: less than 0.1% FP: 110°C (230°F) LEL: 2.5% UEL: 6.6% IP: N/A	Strong oxidizing agents	None identified	Skin or eye irritation

Table 2 (Continued)
Hazardous and Toxic Materials in Soil and Groundwater

Contaminant (Synonym)	Physical Description	Chemical and Physical Properties	Incompatibilities	Target Organs	Symptoms of Exposure
Chlorobezene	Colorless liquid with an almond-like odor	MW: 112.6 BP: 270°F MP: -50°F VP: 9 mm Hg Sol: 0.05% FP: 82°F LEL: 1.3% UEL: 9.6% IP: 9.07 eV	Strong oxidizers	Eyes, skin, respiratory system, CNS, liver	Irritation of the eyes, skin, nose, drowsiness, incoordination CNS depression
1,2-Dichlorobenzene (O-dichlorobenzene)	Colorless to pale yellow liquid with a pleasant aromatic odor	MW: 147 BP: 180°C MP: -17°C VP: 1.2 mm Hg Sol: 0.015% FP: 151°F LEL: 2.2% UEL: 9.2% IP: 9.06 eV	Strong oxidizers, hot aluminum or aluminum alloys	Skin, eyes, liver, and kidneys	Eye and skin irritation; blisters; liver and kidney damage
Diesel exhaust	Appearance and odor vary	MW: NA BP: NA MP: NA VP: Varies Sol: NA FP: NA LEL: NA UEL: NA IP: Varies	Varies	Eyes, respiratory system	Eye irritation, pulmonary function changes, carcinogen

Table 2 (Continued)
Hazardous and Toxic Materials in Soil and Groundwater

Contaminant (Synonym)	Physical Description	Chemical and Physical Properties	Incompatibilities	Target Organs	Symptoms of Exposure
1,2-Dichloropropane (Propylene dichloride)	Colorless liquid with an odor like chloroform	MW: 113 BP: 205°F MP: -148°F VP: 40 mm Hg Sol: 0.26% FP: 60°F LEL: 3.4% UEL: 14.5% IP: 10.87eV	Strong oxidizers and acids	Skin, eyes, respiratory system, liver, kidneys	Eye and skin irritation; drowsiness, light-headedness
1,1-Dichloroethane (DCA)	Colorless liquid with a chloroform-like odor	MW: 99 BP: 135°F MP: -142°F VP: 182 mm Hg Sol: <0.1% FP: 17°F LEL: 6% UEL: 16% IP: N/A	Strong oxidizers, caustics	Skin, liver, and kidneys.	Skin irritation; CNS, depression (drowsiness, loss of consciousness); liver and kidney damage
1,1 Dichloroethene (Vinylidene chloride)	Colorless liquid or gas above 89°F with a mild, sweet chloroform-like odor	MW: 96.9 BP: 89°F MP: -189°F VP: 500 mm Hg Sol: 0.04% FP: -2°F LEL: 6.5% UEL: 15.5% IP: 10.00 eV	Aluminum, sunlight, air, copper, heat, oxidizers	Eyes, skin, respiratory system, CNS, liver, kidneys	Eye, skin, and throat irritation; dizziness, headache nausea, difficulty breathing, liver damage, kidney damage

Table 2 (Continued)
Hazardous and Toxic Materials in Soil and Groundwater

Contaminant (Synonym)	Physical Description	Chemical and Physical Properties	Incompatibilities	Target Organs	Symptoms of Exposure
1,2-Dichloropropane (Propylene dichloride)	Colorless liquid with an odor like chloroform	MW: 113 BP: 205°F MP: -148°F VP: 40 mm Hg Sol: 0.26% FP: 60°F LEL: 3.4% UEL: 14.5% IP: 10.87eV	Strong oxidizers and acids	Skin, eyes, respiratory system, liver, kidneys	Eye and skin irritation; drowsiness, light-headedness
Methyl chloride	Colorless gas with a faint sweet odor which is not noticeable at dangerous concentrations	MW: 50.5 BP: -12°F MP: -144°F VP: 5.0 atm Sol: 0.5% FP: N/A LEL: 8.1% UEL: 17.4% IP: 11.28 eV	Chemically active metals such as potassium, powdered aluminum, zinc, magnesium, water	CNS, liver, kidneys, respiratory system	Dizziness, nausea, vomiting, visual disturbances, stagger, slurred speech, convulsions, coma, liver and kidney damage
Pentachlorophenol (PCP)	Colorless to white crystalline solid with a benzene-like odor	MW: 266.35 BP: 309 to 310°C MP: 190 to 191°C VP: 0 Sol: Insoluble FP: N/A LEL: N/A UEL: N/A IP: N/A	Strong oxidizers, acids, alkalis	CVS, eyes, skin, respiratory system, liver, kidneys, CNS	Eye, nose, and throat irritation, sneezing, cough, weakness, anorexia, loss of weight, sweating, headache, dizziness, nausea, vomiting, difficulty breathing, chest pain, high fever

Table 2 (Continued)
Hazardous and Toxic Materials in Soil and Groundwater

Contaminant (Synonym)	Physical Description	Chemical and Physical Properties	Incompatibilities	Target Organs	Symptoms of Exposure
Tetrachloroethene, (Perchloroethylene, PCE)	Colorless liquid with an odor like ether or chloroform	MW: 166 BP: 250°F MP: -8°F VP: 14 mm Hg Sol: 0.015% FP: N/A LEL: N/A UEL: N/A IP: 9.32 eV	Strong oxidizers, chemically active metals (barium, lithium, beryllium)	Eyes, upper respiratory system, liver, kidneys, CNS	Irritation of eyes, nose, throat; nausea, headache, vertigo; flushing of skin
Trichloroethylene (Trichloroethene, TCE)	Colorless liquid with a sweet chloroform-like odor	MW: 131 BP: 188°F MP: -123°F VP: 50 mm Hg Sol: 0.1% FP: None LEL: 11% UEL: 41% IP: 9.47 eV	Strong caustics; when acidic, reacts with aluminum; chemically active metals (barium, lithium, sodium, magnesium, titanium)	Skin, respiratory system, heart, liver, kidneys, skin, CNS	Eye irritation; dermatitis, headache, vertigo, blurred vision; nausea, vomiting, tremors; loss of feeling in extremities
Vinyl chloride (Chloroethylene)	Colorless gas	MW: 62.5 BP: 7°F MP: -245°F VP: 2580 mm Hg Sol: Slight FP: -108°F LEL: 3.6% UEL: 33% IP: 9.995 eV	Copper oxidizing materials	Liver, blood, respiratory system, CNS, lymphatic system	Weakness, abdominal pain, gastrointestinal bleeding; pallor or blueness of extremities

Table 2 Notes
Hazardous and Toxic Materials in Soil and Groundwater

%:	Percent	LEL:	Lower explosive limit in air, as % by volume
°C:	Degrees Celsius	mg/L	Micrograms per liter
°F:	Degrees Fahrenheit	mg/m3:	Milligrams per cubic meter
<:	Less than	mm Hg:	Millimeters of mercury
>:	Greater than	MP:	Melting point in °F
atm	Atmosphere	MW:	Molecular weight
BP:	Boiling point at 1 atmosphere pressure, in degrees Fahrenheit (°F)	N/A:	Not applicable
CNS:	Central nervous system	ppm:	Parts per million
CVS:	Cardiovascular system	Sol:	Solubility in water at 68°F, as percentage (%) by weight
eV:	Electron volts	UEL:	Upper explosive limit in air, as % by volume
FP:	Flash point, closed cup method, in °F	VP:	Vapor pressure at 1 atmosphere pressure and 68°F
IP:	Ionization potential, in electron volts (eV)		

Table 3
Hazardous and Toxic Materials of Treatment Chemicals

Contaminant (Synonym)	Physical Description	Chemical and Physical Properties	Incompatibilities	Target Organs	Symptoms of Exposure
Hydrogen Peroxide	Colorless liquid with a slightly sharp odor	MW: 34 BP: 286°F MP: N/A VP: 5 mm Hg Sol: Miscible FP: N/A LEL: N/A UEL: N/A IP: 10.54 eV	Oxidizable materials, iron, brass, bronze, chromium, zinc, lead, silver, manganese	Eyes, skin, respiratory system	Irritated eyes, nose, throat; corneal ulcer; bleaching of hair
Potassium Permanganate	Dark purple solid with metallic luster, odorless	MW: BP: MP: VP: Sol: FP: LEL: UEL: IP:	Acids, peroxides, formaldehyde, antifreeze, hydraulic fluids, and all combustible organic or readily oxidizable in organics	GI tract, skin, eyes, respiratory system	Irritated eyes, skin, and respiratory system; gastrointestinal discomfort.
Hydrochloric Acid	Colorless to slightly yellow gas with a pungent, irritating odor	MW: 36.5 BP: -121°F MP: N/A VP: 40.5 atm Sol: 67% FP: N/A LEL: N/A UEL: N/A IP: 12.74 eV	Hydroxides, amines, alkalis, copper, brass, zinc	Eyes, skin, respiratory system	Irritated nose, throat, larynx, cough, choking, dermatitis, eye or skin burns

Table 3 (Continued)
Hazardous and Toxic Materials of Treatment Chemicals

Contaminant (Synonym)	Physical Description	Chemical and Physical Properties	Incompatibilities	Target Organs	Symptoms of Exposure
Ferrous sulfate	monoclinic crystals, pale bluish-green crystals or granules	MW: 151.91 BP: 300° C MP: 64° C VP: N/A Sol: soluble FP: N/A LEL: N/A UEL: N/A IP: N/A	Alkalis, strong oxidizing agents, nitric acid	Gastrointestinal system; CNS	Abdominal pain, diarrhea, pallor or cyanosis, lassitude, drowsiness, hyperventilation due to acidosis, cardiovascular collapse
Sodium Bisulfite	White crystals or powder with a slight odor	MW: 104.1 BP: decomposes MP: N/A VP: N/A Sol: 29% FP: N/A LEL: N/A UEL: N/A IP: N/A	Heat	Eyes, skin, respiratory system	Irritated eyes, skin, mucous membranes

BP: Boiling point at 1 atmosphere pressure, in degrees Fahrenheit (°F)
 CNS: Central nervous system
 CVS: cardiovascular system
 FP: Flash point, closed cup method, in °F
 IP: Ionization potential, in electron volts (eV)
 LEL: Lower explosive limit in air, as % by volume
 mg/L: Micrograms per liter
 mg/m³: Milligrams per cubic meter
 mm Hg: Millimeters of mercury
 MP: Melting point in °F
 MW: Molecular weight
 N/A: Not applicable
 ppm: Parts per million
 Sol: Solubility in water at 68°F, as percentage (%) by weight
 UEL: Upper explosive limit in air, as % by volume
 VP: Vapor pressure at 1 atmosphere pressure and 68°F

Table 4
Exposure Guidelines for Identified Health Significant Site Contaminants

Contaminant (Synonyms)	OSHA PEL		ACGIH TLV		NIOSH REL		IDLH
	8-Hour TWA	15-Minute STEL	8-Hour TWA	15-Minute STEL	8-Hour TWA	15-Minute STEL	
Chlorobenzene	350 mg/m ³ 75 ppm	—	46 mg/m ³ 10 ppm	—	—	—	2400 ppm
Cis-1,2-Dichloroethylene	200 ppm	—	200 ppm	—	200 ppm	—	1000 ppm
1,2-Dichlorobenzene (O-Dichlorobenzene)	50 ppm(c)	—	25 ppm	50 ppm	—	50 ppm (ceiling)	1,700 ppm
1,1-Dichloroethane (DCA)	100 ppm	—	100 ppm	—	100 ppm	—	4,000 ppm
1,2-Dichloroethane (Ethylene Dichloride)	1 ppm	2 ppm	10 ppm	—	1 ppm	2 ppm	—
1,1-Dichloroethene (Vinylidene Chloride)	1 ppm	—	5 ppm	20 ppm	—	—	—
Heptachlor Expoxide ^A	0.5mg/m ³	—	0.5 mg/m ³ (s)	—	0.5 mg/m ³	—	700 mg/m ³
Hexachloroethane	1 ppm (s)	—	1 ppm (s)	—	1 ppm (s)	—	—
Methyl chloride	50 ppm	100 ppm	50 ppm	100 ppm	—	—	20,000 ppm
Pentachlorophenol (PCP)	0.5 mg/m ³	—	0.5 mg/m ³	—	0.5 mg/m ³	—	—
1,1,2,2-Tetrachloroethane	5 ppm (s)	—	1 ppm (s)	—	1 ppm (s)	—	—
Tetrachloroethene (Perchloroethylene, PCE)	25 ppm	—	25 ppm	100 ppm	—	—	500 ppm
Trans 1,2-Dichloroethylene	200 ppm	—	200 ppm	—	200 ppm	—	—
1,2,3-Trichlorobenzene ^B	—	—	5 ppm	5 ppm	—	5 ppm (c)	—
Trichloroethylene (Trichloroethene, TCE)	25 ppm	200 ppm	50 ppm	100 ppm	25 ppm	2 ppm	1,000 ppm

Table 4 (Continued)
Exposure Guidelines for Identified Health Significant Site Contaminants

Contaminant (Synonyms)	OSHA PEL		ACGIH TLV		NIOSH REL		IDLH
	8-Hour TWA	15-Minute STEL	8-Hour TWA	15-Minute STEL	8-Hour TWA	15-Minute STEL	
Diesel exhaust	—	—	—	—	Lowest feasible concentration	—	Carcinogen
Vinyl chloride (Chloroethylene)	1 ppm	5 ppm	5 ppm	—	—	—	—

(s) denotes absorption possible through skin

<: denotes less than.

>: denotes greater than.

A denotes used as surrogate for Heptachlor Epoxide.

ACGIH: denotes American Conference of Government Industrial Hygienists.

B denotes used as surrogate for 1,2,3-Trichlorobenzene.

Eye Irr Lvl: denotes eye irritant level.

f/cc: denotes fibers per cubic centimeter.

Hr: denotes hour.

mg/m3: denotes milligrams per cubic meter.

(c) denotes ceiling limit.

Min: denotes minute

N.D. denotes not detected

Odor Thresh: denotes odor threshold.

OF: denotes olfactory fatigue occurs quickly after initial detection of odor.

OSHA: denotes Occupational Safety and Health Administration.

PEL: denotes permissible Exposure Limit.

ppm: denotes parts per million by volume.

S: denotes skin.

STEL: denotes short-term exposure limit.

TLV: denotes threshold limit value.

TWA: denotes time-weighted average.

Table 5**Exposure Guidelines for Identified Health-Significant Site Contaminants for Treatment Chemicals**

Contaminant (Synonyms)	OSHA PEL		ACGIH TLV		NIOSH REL		IDLH
	8-Hour TWA	15-Minute STEL	8-Hour TWA	15-Minute STEL	8-Hour TWA	15-Minute STEL	
Hydrogen peroxide	-	-	-	-	1 ppm	-	75 ppm
Potassium Permanganate	(c) 5 mg/m ³	-	-	-	-	-	-
Hydrochloric Acid	(c) 5 ppm	-	-	-	(c) 5 ppm	-	50 ppm
Sodium Bisulfite	-	-	5 mg/m ³	-	-	-	-
Ferrous Sulfate	1.0 mg/m ³	-	1 mg/m ³	-	-	-	-

(c) denotes ceiling limit.

(Mn) denotes manganese.

ppm denotes part per million.

mg/m³ denotes milligrams per cubic meter.

Table 6
Activity-Specific Levels of Protection

Task	Activity	Initial Levels of PPE
Mobilization/Demobilization	All	Level D
Delivery and Storage of Hazardous Chemicals	All	Modified Level D
Chemical Handling/Mixing/Injection	All	Modified Level D
Soil/Water Sampling	All	Modified Level D
Groundwater Well Drilling Installation and Monitoring	All	Modified Level D
Spill/Emergency Response	Spill response in chemical storage area	Level C
	Spill response in remedial unit	Modified Level D
Site Restoration	All	Level D
Decontamination of Equipment	All	Modified Level D
Waste Management	Waste characterization	Modified Level D
	Drum handling	Modified Level D
Clearing and Grubbing of Vegetation	All	Level D

PPE levels defined on following page.

Table 7
Action Levels

Analyte	Action Level	Required Action
Level D PPE		
Dust	> .5mg/m ³ above background	Upgrade to Level C, conduct initial dust-control suppression
Unknown VOCs	> 1 ppm above background	Detector tube for TCE, PCE, TCA, Vinyl Chloride
DCA, Vinyl Chloride	≥ 1 ppm ≤ 5 ppm	Upgrade to Level C; Stop work; contact CIH ^C
O ₂	≥ 23.5% or 19.5%	Stop work, contact CIH ^C
LEL	10% of LEL	Stop work; determine cause
Level C PPE		
Dust	> 50 mg/m ³ above background	Stop work; initiate dust suppression
Unknown VOCs	> 50 ppm above background in breathing zone	Use a detector tube for TCE, PCE, TCA, Vinyl Chloride
DCA, Vinyl Chloride	≥ 5 ppm	Upgrade to Level B, contact CIH ^C
O ₂	≥ 23.5% or 19.5%	Stop work, contact CIH ^C
LEL	10% of LEL	Stop work; determine cause
Level B PPE		
Unknown VOCs	100 ppm above background in BZ	Stop work; detector tube for identify contaminant contact CIH ^C
O ₂	≥ 23.5% or 19.5%	Stop work, contact CIH ^C
LEL	10% of LEL	Stop work; determine cause

A denotes five excursions above the action level in any 15-minute period or a sustained reading in excess of the action levels for 5 minutes will trigger a response.

B denotes frequency of air monitoring may be adjusted by the CIH after sufficient characterization of the site contaminants has been completed, tasks have been modified, or site controls have proven effective.

C denotes contact with the CIH must be made prior to continuance of work. The Program CIH may then initiate integrated air sampling along with additional engineering controls.

VOCs denotes volatile organic compounds.

O₂ denotes Oxygen.

LEL denotes Lower Explosive Limit.

PCE denotes tetrachloroethene (perchloroethene).

TCA denotes trichloroethane.

TCE denotes trichloroethene.

Table 8
Real-Time Air Monitoring Frequency and Location

Work Activity	Instrument	Frequency ¹	Location
Mobilization	PID or FID	N/A	N/A
	Miniram	N/A	N/A
	O ₂ /LEL	N/A	N/A
	Detector Tube (TCE, PCE, TCA, Vinyl Chloride)	N/A	N/A
Delivery and Storage of Hazardous Chemicals	PID or FID	N/A	N/A
	Miniram	N/A	N/A
	O ₂ /LEL	N/A	N/A
	Detector Tube (TCE, PCE, TCA, Vinyl Chloride)	N/A	N/A
Chemical Handling/Mixing Injection	PID or FID	N/A	N/A
	Miniram	Continuously	Area/BZ of employee
	O ₂ /LEL	Periodically	Area/BZ of employee
	Detector Tube (TCE, PCE, TCA, Vinyl Chloride)	N/A	N/A
Soil/Water Sampling	PID or FID	Periodically	BZ of employee
	Miniram	Periodically	BZ of employee
	O ₂ /LEL	Continuously	Area/BZ of employee
	Detector Tube (TCE, PCE, TCA, Vinyl Chloride)	Periodically	Area
Groundwater, Well Drilling, Installation, and Monitoring	PID or FID	Periodically	BZ of employee
	Miniram	N/A	N/A
	O ₂ /LEL	Periodically	BZ of employee
	Detector Tube (TCE, PCE, TCA, Vinyl Chloride)	Per action level	BZ of employee
Spill/Emergency Response	PID or FID	Periodically	BZ of employee
	Miniram	N/A	N/A
	O ₂ /LEL	Continuously	Area/BZ of employee
	Detector Tube (TCE, PCE, TCA, Vinyl Chloride)	Per action level	BZ of employee
Site Restoration	PID or FID	Periodically	BZ of employee
	Miniram	Periodically	Area
	O ₂ /LEL	N/A	N/A
	Detector Tube (TCE, PCE, TCA, Vinyl Chloride)	Per action levels	BZ of employee

Table 8 (Continued)
Real-Time Air Monitoring Frequency and Location

Work Activity	Instrument	Frequency ¹	Location
Decontamination of Equipment	PID or FID	Periodically	Area/BZ of employee
	Miniram	N/A	N/A
	O ₂ /LEL	Periodically	Area/BZ of employee
	Detector Tube (TCE, PCE, TCA, Vinyl Chloride)	Per action levels	Area/BZ of employee
Waste Management	PID or FID	Periodically	Area
	Miniram	N/A	N/A
	O ₂ /LEL	Periodically	Area/BZ of employee
	Detector Tube (TCE, PCE, TCA, Vinyl Chloride)	Per action levels	Area/BZ of employee

PID—Photionization detector

FID—Flameionization detector

BZ—Breathing Zone

Table 9
Chemical Delivery/Storage/Handling/Incompatibility Guide

Chemical Name	CAS No.	Concentration/ Volume	Remedial Unit	Storage Unit	Required PPE	Incompatibility
Potassium Permanganate	7722-64-7	35 g/L	2, 5	Solid Oxidizer	Polyurethane coated-Tyvek, or equivalent suit, Nitrile gloves, Safety glasses	Strong reducing agents; strong acids; peroxides; alcohols; chemically active metals; avoid heat
Hydrogen Peroxide	7722-84-1	20%	4, 6	Liquid Oxidizer	Rubber boots, Neoprene gloves, Safety glasses/ goggles	Reducing agents, Iron/heavy metals, avoid excessive heat, acids, bases, salts of metals, organic materials, flammable substances
Iron Sulfate	7782-63-0	0.5 mm	4, 6	Reducing Agent	FF/APR w/HEPA filter (if dust issues), rubber/ impervious gloves, safety glasses	Nitric acid, strong oxidizing agents
Hydrochloric Acid	7647-01-0	37%	4, 6	Acid	FF shield, impervious gloves	Strong bases, metals and metaloxides, peroxides, avoid heat, cyanides, sulfites, sulfides, formaldehyde
Sodium Bisulfite	7631-90-5	40%	2, 4, 5, 6	Reducing Agent	Safety glasses, Nitrile gloves	Strong acids, strong oxidizers

g/L—grams per liter

FF—Full face

APR —air-purifying respirator

HEPA—high efficiency particulate air

Table 10
Hazardous Chemical Inventory Form

Chemical Name	Hazard Classification	CAS No.	Concentration/ Volume	Reportable Quantity	Threshold Planning Quantity	Max. Quantity On site	Ave. Daily Usage	Total Used for Project
Potassium Permanganate (KMnO ₄)	Solid Oxidizer	7722-64-7	35 g/L	100 lbs. (45.4 kg)				
Hydrogen Peroxide (H ₂ O ₂)	Liquid Oxidizer	7722-84-1	20%	N/A				
Iron Sulfate (FeSO ₄)	Reducing Agent	7782-63-0	0.5 mm	1,000 lbs. (454 kg)				
Hydrochloric Acid (HCl)	Acid	7647-01-0	5%	5,000 lbs. (2270 kg)				
Sodium Bisulfite (NaHSO ₃)	Reducing Agent	7631-90-5	40%	5,000 lbs. (2270 kg)				

APPENDIX A
CHEMICAL-OXIDATION SYSTEM
OPERATIONAL PROCEDURES

FINAL
CHEMICAL OPERATION SYSTEM OPERATIONAL PROCEDURES
CHEMICAL OXIDATION TREATABILITY STUDIES, REMEDIAL UNITS 2, 4, 5, AND 6 AT PARCEL C
HUNTERS POINT SHIPYARD
SAN FRANCISCO, CALIFORNIA

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1.0 Chemical Injection System Operational Procedures

These procedures are designed to outline the key steps involved with the chemical oxidant injection at Hunter's Point. Minimum site-wide PPE requirements include: hard hat, safety glasses, steel-toed boots, and reflective safety vest. This PPE shall be donned prior to proceeding to the work site.

1.1 Transfer of Chemicals from the Chemical Storage Area to the Remedial Unit

1. Review the procedures, hazards, and personal protective equipment required for this task
2. Replenish the safety station supplies as needed
3. Don the proper PPE (splash shield, Tyvek suit, and over boots or equivalent)
4. Evaluate the potential for heat and cold stress
5. Check seal on containers to be moved
6. Determine destination for materials and identify a clear travel path; ensure that there is secondary containment for the bulk chemical within the Remedial Unit
7. Perform daily equipment inspection
8. Discuss forklift signal procedures and identify a clear travel path
9. Segregate chemical by DOT Hazard classification
10. Transport the bulk chemicals separately via forklift
11. Record chemical(s) transfer on the Chemical Storage Area Inventory Log
12. Secure the Chemical Storage Area
13. Bag used PPE for proper disposal

2.0 Preparation of Chemical Mixtures in the Remedial Unit

Each of the chemicals utilized in the chemical oxidation treatment requires some preparation prior to injection. Before preparation of any chemical solutions, the equipment and plumbing in the remedial units shall be tested for leaks using clean water.

2.1 Leak Testing

1. Review the procedures, hazards, and personal protective equipment required for this task
2. Replenish the safety station supplies as needed
3. Don the proper PPE (splash shield, Tyvek suit, and over boots or equivalent)
4. Evaluate the potential for heat/cold stress
5. Evaluate plumbing and connections; visually inspect to ensure that all pipes are properly connected, and that the flow direction is labeled; inspect valves to ensure operation and proper positioning for the leak test
6. Close the injection valves
7. Fill the system with water and pressurize by running the transfer pumps
8. Visually inspect piping/equipment connections for leaks, and repair as needed; do not proceed with operation until any identified leaks are resolved
9. Drain the water from the system through the drain valve in the bottom of the tanks
10. Close all valves and document leak test results

2.2 Potassium Permanganate (KMnO₄) Solution Preparation

The bulk potassium permanganate chemical is a purple, crystalline solid. A 3.5% by weight solution of the KMnO₄ will be prepared for delivery to the subsurface. Review the procedures, hazards, and personal protective equipment required for this task;

1. Replenish the safety station supplies as needed
2. Don the proper PPE (splash shield, Tyvek suit, and over boots or equivalent)
3. Evaluate the potential for heat/cold stress
4. Inspect system plumbing; ensure that valves are set to proper positions for permanganate solution preparation; make sure that the outlet valves, specifically

the Mixing tank drain valve and the Mixing tank delivery valve to the Holding tank, are closed

5. Open the water valve to the Mixing tank
6. Fill the tank approximately half full with water, note the actual amount of water transferred on the water flow totalizer
7. Open the recirculation system valves for the Mixing tank; start the recirculation pump for the mixing tank
8. Start the tank mixer
9. Open Venturi valve on solid chemical transfer system; transfer potassium permanganate solid into the mix tank
10. Close the Venturi valve on the solid chemical transfer system
11. Open the water valve to the Mixing tank; complete the chemical mixture by adding an appropriate amount to water; close the water valve to the mixing tank
12. Ensure that the outlets from the Holding tank (specifically the Holding tank drain valve and the Holding tank delivery valve to the Injection wells) are closed; open the valves from the mix tank to the holding tank
13. Transfer the KMnO_4 solution to the Holding tank
14. Continue running the transfer mixing pump until all residual KMnO_4 solution has been transferred to the Holding tank; shut off the recirculation pump and close the recirculation loop inlet to the Holding tank
15. Begin the process of preparing a batch of 3.5% KMnO_4 solution in the Mixing tank (Steps 6 through 12 of this procedure) as needed based upon proposed injection volumes and time schedule
16. Close all valves and document potassium permanganate solution preparation including volumes of water and pounds of permanganate used

2.3 Hydrochloric Acid (HCl) Acidified Water Preparation

The bulk hydrochloric acid is a 5% solution in water. A pH 3 solution of HCl and water will be prepared for delivery to the subsurface and solution preparation.

1. Review the procedures, hazards, and personal protective equipment required for this task
2. Replenish the safety station supplies as needed
3. Don the proper PPE (splash shield, Tyvek suit, and over boots or equivalent)

4. Evaluate the potential for heat/cold stress
5. Inspect system plumbing; ensure that valves are set to proper positions for chemical preparation; make sure that the outlet valves are closed;
6. Open the water valve to the Mixing tank
7. Fill the tank with water; note the actual amount of water transferred from the flow totalizer, close the water valve
8. Start the tank mixer
9. Open the concentrated, bulk chemical transfer valve
10. Start the liquid metering pump at a low setting; **SLOWLY** transfer the concentrated hydrochloric acid to the Mixing tank; record the amount transferred
11. Verify and document the pH of the tank contents; add additional HCl as needed to achieve pH 3
12. Stop the liquid metering pump and close the concentrated chemical transfer valve
13. Prepare only the amount of 10% HCl solution that will be used in one daily operation of chemical injection
14. Close all valves and document acidified water preparation

2.4 Hydrogen Peroxide (H₂O₂) Solution Preparation

The bulk hydrogen peroxide chemical is a 50% by weight solution or less. A 10% to 20% solution of the H₂O₂ will be prepared for delivery to the subsurface.

1. Review the procedures, hazards, and personal protective equipment required for this task
2. Replenish the safety station supplies as needed
3. Don the proper PPE (splash shield, Tyvek suit, and over boots or equivalent)
4. Evaluate the potential for heat and cold stress
5. Inspect system plumbing; ensure that valves are set to proper positions for hydrogen peroxide solution preparation; make sure that the outlet drain valves are closed
6. Open the water valve to the Mixing tank
7. Fill the tank with acidified water; note the actual amount of water transferred from the flow totalizer; close the water valve
8. Start the tank mixer

9. Inspect system plumbing; ensure that valves are set to the proper position for hydrogen peroxide solution preparation
10. Start the chemical transfer
11. Transfer hydrogen peroxide solution, measuring the amount either through a flow totalizer on the drum pump, or by noting the average flow rate over a specific period of time
12. Stop the chemical transfer; shut off the chemical mixer
13. Close the metering valve on the transfer line and close the bulk chemical transfer valve
14. Prepare only the amount of H₂O₂ solution that will be used in one daily operation of chemical injection
15. Close all valves and document hydrogen peroxide solution preparation including volume of activated waste and volume of concentrated peroxide used

2.5 Ferrous Sulfate (FeSO₄)

The bulk ferrous sulfate chemical is a solid. A 0.05% by weight solution of the FeSO₄, acidified with hydrochloric acid (HCl) to a pH of 3 will be prepared for delivery to the subsurface.

1. Review the procedures, hazards, and personal protective equipment required for this task
2. Replenish the safety station supplies as needed
3. Don the proper PPE (splash shield, Tyvek suit, and over boots or equivalent)
4. Evaluate the potential for heat and cold stress
5. Inspect system plumbing; ensure that valves are set to proper positions for chemical preparation; make sure that the outlet valves, specifically the Mixing tank drain valve and the Mixing tank delivery valve to the Holding tank, are closed;
6. Open the acidified water valve to the Mixing tank
7. Fill the tank approximately half full with water, note the actual amount of water transferred from the flow totalizer
8. Open the recirculation system valves for the Mixing tank; start the recirculation pump for the mixing tank
9. Start the tank mixer
10. Open Venturi valve on solid chemical transfer system; transfer ferrous sulfate solid
11. Close the Venturi valve on the solid chemical transfer system

12. Start the acid transfer, drum pump; slowly add acid to the ferrous sulfate solution
13. Open Sample Port and pH aqueous sample
14. Open the water valve to the Mixing tank; complete the chemical mixture by adding the proper amount of acidified water, close the water valve to the Mixing tank
15. Measure the pH of the solution and record on log sheet
16. Ensure that the 2 outlets from the Holding tank are closed; open valves to complete transfer flowpath
17. Transfer the acidified (pH 3), 0.05% FeSO₄ solution to the Holding tank
18. Continue the transfer until complete
19. Shut off the recirculation pump and close the recirculation loop
20. Only prepare the amount of acidified (pH 3), FeSO₄ solution that will be used in one daily operation of chemical injection
21. Close all valves; document volumes and chemical usage

2.6 Sodium Bisulfite (NaHSO₃) Solution Preparation

The bulk sodium bisulfite chemical is a 38% solution. A 10% by weight solution of NaHSO₃ will be prepared for emergency response and/or system clearing. **NEVER ADD CONCENTRATED SODIUM BISULFITE SOLIDS OR SOLUTIONS DIRECTLY TO CHEMICAL SOLUTIONS. A VIOLENT REACTION MAY OCCUR RESULTING IN INJURY.**

1. Review the procedures, hazards, and personal protective equipment required for this task
2. Replenish the safety station supplies as needed
3. Don the proper PPE (splash shield, Tyvek suit, and over boots or equivalent)
4. Evaluate the potential for heat and cold stress
5. Inspect system plumbing; ensure that valves are set to proper positions for sodium bisulfite solutions preparation; make sure that outlet valves are closed
6. Open the water valve to the Mixing tank
7. Fill the tank approximately half full with water; note the actual amount of water transferred from the flow totalizer
8. Start the tank mixer

9. Open valve on chemical transfer system; transfer sodium bisulfite solution
10. Close the valve on the solution transfer system
11. Open the water valve to the Mixing tank; complete the chemical mixture by adding more water; close the water valve to the Mixing tank
12. Transfer the prepared 10% NaHSO₃ solution to the emergency response Holding tank and Hudson sprayers
13. Continue the transfer until complete
14. Try to only prepare the amount of 10% NaHSO₃ that will be used in one daily operation of chemical injection,
15. Close all valves and document bisulfite solutions preparation

3.0 Injection of Chemicals into the Subsurface

Potassium permanganate will be injected at Remedial Units 2 and 5. Fenton's Reagents will be injected at Remedial Units 4 and 6.

3.1 Permanganate Injection

Two tanks will be used to provide a steady supply of 3.5% KMnO_4 solution. The Mixing tank will be used to prepare the 3.5% KMnO_4 solution from the bulk chemical solid. The Holding tank will be used to hold the prepared 3.5% KMnO_4 solution for subsequent injection.

3.1.1 Application Through Injection Wells

1. Review the procedures, hazards, and personal protective equipment required for this task
2. Replenish the safety station supplies as needed
3. Don the proper PPE (splash shield, Tyvek suit, and over boots or equivalent)
4. Evaluate the potential for heat and cold stress
5. Inspect system plumbing; ensure that valves are set to proper positions for chemical injection; make sure that the inlet and outlet valves to the Holding tank are closed; make sure that the recirculation loop valves; open prior to delivery pump startup
6. Close the flow rate metering valve on the chemical injection line
7. Turn on the chemical delivery pump
8. Slowly open the outlet valve on the chemical injection line
9. Monitor injection flowrate, pressure and temperature; adjust flowrate to maintain safe operating pressures and temperatures; document volume of solution delivered

3.1.2 Application Through Drive Points

Same as the procedure for injection of permanganate through the injection wells, except the solution will be injected stepwise as the drive point is pushed further into the subsurface.

Injections will be performed at regular intervals below ground surface (bgs).

3.2 Fenton's Reagent Injection

Fenton's Reagent will be injected in a cyclic manner. Cyclic injections of acidified water, hydrogen peroxide, acidified water, and then ferrous sulfate will reduce mixing of reagents in the piping system.

1. Review the procedures, hazards, and personal protective equipment required for this task
2. Replenish the safety station supplies as needed
3. Don the proper PPE (splash shield, Tyvek suit, and over boots or equivalent)
4. Evaluate the potential for heat/cold stress
5. Inspect system plumbing; ensure that valves are set to proper positions for chemical injection; make sure that the inlet and outlet valves to the Holding tank are closed; make sure that the recirculation loop valves are open
6. Close the flow rate metering valve on the chemical injection line
7. Document the volume of fuel injected

3.2.1 Acidified Water Injection

- Open the outlet valve from the acidified water storage tank
- Turn on the acidified water delivery pump and adjust flow rate as needed
- The volume of acidified water to be pumped into the subsurface should be equivalent to 3-5 times the plumbing volume
- Shut off the acidified water delivery pump and adjust flow rate as needed
- Close the outlet valve from the acidified water storage tank
- Document the volume of fuel injected

3.2.2 Hydrogen Peroxide Injection

1. Open the outlet valve from the 10% hydrogen peroxide storage tank
2. Turn on the hydrogen peroxide delivery pump; adjust flow rate as needed
3. The volume of hydrogen peroxide to be pumped into the subsurface will be location specific
4. Shut off the hydrogen peroxide delivery pump
5. Close the outlet valve from the 10% hydrogen peroxide storage tank
6. Document the volume of fuel injected

3.2.3 Acidified Water Injection

1. Open the outlet valve from the acidified water storage tank
2. Turn on the acidified water delivery pump; adjust flow rate as needed
3. The volume of acidified water to be pumped into the subsurface should be equivalent to 3-5 times the plumbing volume
4. Shut off the acidified water delivery pump
5. Close the outlet valve from the acidified water storage tank
6. Document the volume of fuel injected

3.2.4 Ferrous Sulfate Injection

1. Open the outlet valve from the ferrous sulfate storage tank
2. Turn on the ferrous sulfate delivery pump; adjust flow rate as needed
3. The volume of ferrous sulfate to be pumped into the subsurface will be site specific, and is not yet available
4. Shut off the ferrous sulfate delivery pump
5. Close the outlet valve from the ferrous sulfate storage tank
6. Document the volume of fuel injected

3.2.5 Acidified Water Injection

1. Open the outlet valve from the acidified water storage tank
2. Turn on the acidified water delivery pump; adjust flow rate as needed
3. The volume of acidified water to be pumped into the subsurface should be equivalent to 3-5 times the plumbing volume
4. Shut off the acidified water delivery pump
5. Close the outlet valve from the acidified water storage tank
6. Document the volume of fuel injected

3.3 Changed Field Conditions Procedure

In the event that unexpected circumstances are encountered in the field and procedures require modification or become unfeasible, the technical lead or project manager with the help of the site health and safety officer may develop alternative procedures. Operations will be stopped until evaluation of changed conditions has been completed, documented, and approved by the

responsible parties. The technical lead, project manager, and site HSO signatures (or designees) will be required for approval of any modifications. Documentation of the modifications must be provided on the attached Procedure Variance Request Form. Variances will be approved for the duration of the project or until a specified expiration date has been reached.

No request for variation may be implemented until appropriate approvals are obtained. Required approvals are as follows:

1. Technical lead
2. Project Manager
3. Site Health and Safety Officer

3.4 Variance Distribution

Copies of Procedure Variance Request forms will be issued to the variance requestor and all approvers of the variance. All variances are to be placed in the Site Health and Safety Plan, Equipment Operations and Maintenance Manual until they expire or are revoked at which time they shall become a permanent part of the project file. Copies of any Procedure Variance Request forms will be submitted to the project Quality Control Officer.

A copy of variances shall be maintained at the work site and shall be reviewed with employees during Tailgate Safety Meetings.

Procedure Variance Request Form _____

Variance Request for Procedure:	Date of Request:
Requestor:	Does variation require modification to SHSP? (If so, Health and Safety Approval by CIH)

Describe Reason for Variance: (use back of page or additional pages as needed.)

Alternate Procedure(s) that will be implemented:

Approved	Rejected
Technical Lead/Project Manager	Technical Lead/Project Manager
Health and Safety	Health and Safety
Quality Control	Quality Control

3.4.1 Variance Distribution

Copies of Procedure Variance Request forms will be issued to the variance requestor and all approvers of the variance. All variances are to be placed in the Site Health and Safety Plan, Equipment Operations and Maintenance Manual until they expire or are revoked at which time they shall become a permanent part of the project file. Copies of any Procedure Variance Request forms will be submitted to the project Quality Control Officer.

A copy of variances shall be maintained at the work site and shall be reviewed with employees during Tailgate Safety Meetings.

APPENDIX B

EMERGENCY PHONE NUMBERS

Emergency Phone Numbers

Contact	Phone Number
Hunters Point Shipyard (HPS) Fire Department Emergency Non-Emergency	911 (415) 330-0577
HPS Fire Chief	(415) 330-0580
HPS Security Department Emergency Non-Emergency	911 (415) 822-1653
Hazardous Materials Response (Fire Dept.) Emergency Non-Emergency	911 (415) 330-0577
Medical Response Emergency Non-Emergency (Fire Dept.)	911 (415) 330-0577
Poison Control Center (San Francisco)	(800) 523-2222
National Response Center	(800) 424-8802
Key Project and IT Personnel	
IT Program Manager: Stewart Bornhoft	(925) 288-2081
Program CIH: Fred Mlakar, CIH	(949) 660-5413 (949) 451-7658 (Pager)
Project Manager: Michael Garant	(925) 288-2115
Site Super/Competent Person: Don Tillery	(415) 671-2806
Site Health & Safety Specialist: Steve McNearney	(415) 671-2804
Site Health & Safety Technician: Dennis Rich/Phil Richie	(415) 671-2805
Health & Safety Administrator: Carey Von Williams	(925) 288-2378 Pager: (888) 537-9657
Technical Lead: Bruce Marvin	(925) 288-2351 (415) 725-9914 (cellphone)
Chemical Engineer: David Cacciatore	(925) 288-2299
Health Resources	(800) 350-4511
Navy Contact Resident Officer in Charge of Construction: Andy Uehisa Bill Radezvich	(510) 749-5945 (650) 244-2555
Navy Contact Resident Officer in Charge of Construction: Dave DeMars	(619) 532-0912
Hospital: San Francisco General Directions: Exit Hunters Point Annex on Evans Avenue. Turn left onto Ceasar Chavez Street; proceed under the freeway. Veer right onto Potrero Avenue. Hospital will be four streets down on the right side (22 nd Street).	22nd Street and Portrero Avenue San Francisco, CA (415) 206-8000

APPENDIX C

ACTIVITY HAZARD ANALYSES

List of Forms

Activity Hazard Analysis—Mobilization/Demobilization
Activity Hazard Analysis—Chemical Storage and Handling
Activity Hazard Analysis—Chemical Mixing and Injection
Activity Hazard Analysis—Soil/Water Sampling
Activity Hazard Analysis—Well Drilling, Installation, and Monitoring
Activity Hazard Analysis—Chemical Spill/Emergency Response
Activity Hazard Analysis—Site Restoration
Activity Hazard Analysis—Decontamination of Equipment
Activity Hazard Analysis—Clearing and Grubbing of Vegetation
Activity Hazard Analysis—Waste Management

ACTIVITY HAZARD ANALYSIS
Mobilization/Demobilization

Page 1 of 2

Principal Steps	Potential Hazards	Recommended Controls
Placement/unloading of equipment and materials	Heavy lifting	Use proper lifting techniques. Lifts greater than 60 pounds require assistance or mechanical equipment; size-up the lift. Recommend wearing a back support if possible.
	Falling objects	Wear a hardhat, stay alert and clear of materials suspended overhead, wear steel-toed boots.
	Fire	Fire extinguishers shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition.
		Fire lanes providing access to all areas shall be established and maintained free of obstruction (the minimum space between one-story non-fire-resistant buildings shall be 20 feet). Initial survey of the suitability and effectiveness of fire prevention and protection measures and facilities at each installation shall be made by competent persons.
	High winds	Mobile/portable facilities shall be anchored to withstand high winds.
Installation of office and support structures	Contact with utilities, installation of electrical power	Above and underground utilities shall be located. A qualified person shall install required utilities in compliance with national, state, and local codes.
	Slip, trip, and fall hazards	Determine best access route before transporting equipment.
	Cut hazards	Wear adequate hand protection.
	Fire	A/BC Fire extinguishers shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition.
	Contact with moving equipment/vehicles	Work area will be barricaded/demarcated.
	Hazard communications	Label all containers as to contents (fuel can, etc.).
		Obtain Material Safety Data Sheets for materials brought to the site.
	Strains and sprains	Use the proper tool for the job being performed.
		Avoid twisting/turning while pulling on tools, materials, etc.
	Unattended worker	"Buddy System" visual contact will be maintained between personnel site activities.
	Level/Blocking trailer, driving stakes (stabilization) anchoring	Use caution when jacking and placing blocks or cribbing. If ground is soft, add stone to secure footing.
	Setting steps in place	Steps must be Occupational Safety and Health Administration-approved (with proper handrails, midrail, steps, with a platform in front of door; refer to U.S. Army Corps of Engineers (Section 21.E 02, 05, 07, 08)
	Setting steps in place	Lighting for work and means of egress; electrical hookup to trailers to be made by qualified electrician. GFCIs required on all circuits.

ACTIVITY HAZARD ANALYSIS
Mobilization/Demobilization

Page 2 of 2

Principal Steps	Potential Hazards	Recommended Controls
Installation of office and support structures	Clearing hazards	If clearing is necessary, tree cutting will comply with chainsaw safety standards.
	Ventilation	Trailer ventilation shall not bring in exhaust from vehicles, etc.
Equipment to be used	Inspection Requirements	Training Requirements
Hand tools PPE Heavy equipment Vendor trucks	Pre-post maintenance Visual prior to use	Tailgate Safety Meeting Site-specific orientation Hazard communication

ACTIVITY HAZARD ANALYSIS Chemical Storage and Handling

Page 1 of 4

Principal Steps	Potential Hazards	Recommended Controls
Preparation of ground for siting of Chemical Storage Facility	Heavy equipment operations	<p>Inspect all heavy equipment before use.</p> <p>Only trained and certified operators may utilize equipment (see OSHA regulations).</p> <p>All ground personnel will be prohibited from working in areas while heavy equipment is in use.</p> <p>All heavy equipment must be equipped with roll-over protection systems (ROPS) and backup alarms.</p> <p>Seat belts will be worn while operating equipment.</p>
	Noise	Noise protection shall be worn when working with heavy equipment.
Chemical Storage Facility Layout	Inhalation hazards	<p>Storage facility should be well-ventilated, and in an outdoor location away from all heat sources.</p> <p>Secondary containment should be provided for each class of chemical.</p>
	Fire	Two fire extinguishers utilizing water as the extinguishing media should be installed in and around the storage facility
		Store chemicals in a controlled, outdoor location to minimize fire hazards.
		Mark storage cells for classes of allowable chemicals
	Trespassing and Theft	Ensure chemicals stored in areas are compatible. Provide berms or other barriers to prevent spilled materials from migrating to cells of non-compatible chemicals.
		Secure the facility (lock doors and fence the surrounding area) and provide lighting.
Transfer chemicals from shipping to storage facility	Heavy Lifting	<p>Use proper lifting techniques (flex at the knees and use legs when lifting).</p> <p>Obey sensible lifting limits (60 pounds individual lifting maximum).</p> <p>Use mechanical lifting equipment to move large, awkward loads.</p>
	Slips, trips and falls	<p>Clear walkways of equipment, vegetation, and excavated material.</p> <p>Maintain good housekeeping.</p>

ACTIVITY HAZARD ANALYSIS
Chemical Storage and Handling

Page 2 of 4

Principal Steps	Potential Hazards	Recommended Controls
Transfer chemicals from shipping to storage facility	Heavy equipment operations	<p>Inspect all heavy equipment before use.</p> <p>Only trained, experienced operators may operate equipment.</p> <p>All ground personnel will be prohibited from working in areas while heavy equipment is in use.</p> <p>All heavy equipment must be equipped with roll-over protection systems (ROPS) and backup alarms.</p> <p>Seat belts will be worn while operating equipment.</p>
	Noise	Noise protection shall be worn when working with heavy equipment.
	Contact with moving equipment/vehicles	Work area will be barricaded/demarcated.
	Fire	<p>A/B/C Fire extinguishers shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition for use with equipment fires.</p> <p>Fires involving the storage chemicals should be extinguished with water.</p>
Segregation of chemicals	Fire/Chemical exposure	<p>The chemicals that will be stored on-site include: hydrogen peroxide (H₂O₂), potassium permanganate (KMnO₄), hydrochloric acid (HCl), sodium bisulfite (NaHSO₃), and ferrous sulfate (FeSO₄)</p> <p>Four segregated chemical storage cells will be required to safely segregate these chemicals: 1) H₂O₂, 2) KMnO₄, 3) HCl, and any other acids, and 4) NaHSO₃ and FeSO₄. Refer to map layout of Chemical Storage Facility.</p> <p>Refer to OP for Emergency/Spill Response Procedures.</p>
	Contact between incompatible chemicals	<p>Segregate chemicals in accordance with hazards described in the MSDS.</p> <ul style="list-style-type: none"> ▪ Maintain barriers between cells ▪ Placard cells for proper storage
	Improper or missing labels	Visually inspect all chemical storage containers for proper labeling.

ACTIVITY HAZARD ANALYSIS
Chemical Storage and Handling

Principal Steps	Potential Hazards	Recommended Controls
Movement of chemicals to Remedial Unit from chemical storage area	Chemical exposure/chemical splash	<p>Train workers on the hazards associated with site chemicals. Applicable MSDS sheets will be reviewed by all employees working with chemicals.</p> <p>PPE – Safety glasses, face shield, chemical resistant clothing, hard-toed shoes with rubber covers, and rubber gloves.</p> <p>Chemical containers must be secured and sealed prior to movement.</p> <p>Move materials slowly to prevent splashing.</p> <p>Label tanks to identify the chemical contents, and the associated hazards.</p>
	Fire	<p>Ensure that tanks are clear of other chemicals and debris prior to movement.</p> <p>Cover tanks after filling to prevent contamination due to the elements.</p> <p>Fire extinguishers shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition.</p> <p>Spill containment measures shall be readily available to contain spill and prevent chemical mixing and/or migration off-site.</p>
	Skin, eye and respiratory irritation	<p>PPE – Safety glasses, chemical resistant clothing, hard-toed shoes, and rubber gloves.</p> <p>Move materials slowly to minimize the potential for airborne distribution.</p>
	Heavy lifting	<p>Use proper lifting techniques (flex at the knees and use legs when lifting).</p> <p>Obey sensible lifting limits (60 pounds individual lifting maximum).</p> <p>Use mechanical lifting equipment to move large, awkward loads.</p>
	Slips, trips and falls	<p>Clear walkways of equipment, vegetation, and excavated material.</p> <p>Maintain good housekeeping.</p>
	Pinch-points/Cut Hazards	<p>Keep hands, fingers, and feet clear of moving/suspended materials and equipment.</p> <p>Wear adequate hand protection.</p>

ACTIVITY HAZARD ANALYSIS
Chemical Storage and Handling

Page 4 of 4

Principal Steps	Potential Hazards	Recommended Controls
Movement of chemicals to Remedial Unit from chemical storage area (Continued)	Heavy equipment operations	Inspect all heavy equipment before use. Only trained, experienced operators may operate equipment. All ground personnel will be prohibited from working in areas while heavy equipment is in use. All heavy equipment must be equipped with roll-over protection systems (ROPS) and backup alarms. Seat belts will be worn while operating equipment.
	Contact with moving equipment/vehicles	Work area will be barricaded/demarcated.
	Hot/Cold Stress	Train workers to recognize symptoms of hot and cold stress. Implement IT Procedures HS400 and HS401 as appropriate. Instruct workers using impermeable clothing to have extra dry clothes to change into.
	Rotating equipment hazards	No loose articles of clothing will be worn when operating mixer.
Equipment to be used	Inspection Requirements	Training Requirements
Forklift Drum Dolly PPE	Pre- and post-maintenance Visual inspection prior to use CESPD Form 150R	Hazcom Industrial Truck use Tailgate Safety Meeting Site specific orientation

ACTIVITY HAZARD ANALYSIS
Chemical Mixing and Injection

Page 1 of 3

Principal Steps	Potential Hazards	Recommended Controls
Dilution of chemicals within process tanks	Chemical exposure	<p>Train workers on the hazards associated with site chemicals. Applicable MSDS sheets will be reviewed by all employees working with chemicals. Chemical mixing and injection equipment-specific training is required.</p> <p>Perform visual inspection of process tanks for contents and signs of contamination prior to use.</p> <p>Transfer materials slowly to prevent splashing.</p> <p>PPE – Safety glasses, face shield, chemical resistant clothing, steel-toed shoes with rubber covers, and rubber gloves.</p> <p>Add diluant (water) to the process tanks before chemicals.</p> <p>Label tanks to identify the chemical contents, and the associated hazards.</p>
	Fire/Explosion	<p>Dilute concentrated chemicals by adding to water, not by adding water to the concentrated chemical</p> <p>Ensure that tanks are clear of other chemicals, debris and/or water prior to transferring chemicals.</p> <p>Cover tanks after filling to prevent contamination due to the elements.</p> <p>Fire extinguishers shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition.</p>
	Spills/Leaks	<p>Spill containment measures shall be readily available to contain spill and prevent chemical mixing and/or migration off-site.</p>
Dilution of concentrated chemical spills	Chemical exposure due to spillage or leaks	<p>Train workers on the hazards associated with site chemicals. Applicable MSDS sheets will be reviewed by all employees working with chemicals. Chemical mixing and injection equipment-specific training is required.</p> <p>PPE – Safety glasses, face shield, chemical resistant clothing, hard-toed shoes with rubber covers, and rubber gloves.</p>
Transfer of chemical solutions through plumbing connections	Chemical exposure	<p>Train workers on the hazards associated with site chemicals. Applicable MSDS sheets will be review by all employees working with chemicals. Chemical mixing and injection equipment-specific training is required.</p> <p>Transfer materials slowly to prevent splashing.</p> <p>PPE – Safety glasses, face shield, chemical resistant clothing, hard-toed shoes with rubber covers, and rubber gloves.</p> <p>Label piping to identify the chemical contents, and the associated hazards, and label the flow directions.</p>

ACTIVITY HAZARD ANALYSIS
Chemical Mixing and Injection

Page 2 of 3

Principal Steps	Potential Hazards	Recommended Controls
Transfer of chemical solutions through plumbing connections (Continued)	Fire	Ensure that pipes are clear of other chemicals, and/or debris prior to transferring chemicals. Fire extinguishers (water media) shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition.
	Chemical spills or leaks	Spill containment measures shall be readily available to contain spill and prevent chemical mixing and/or migration off-site.
	Heavy lifting	Use proper lifting techniques (flex at the knees and use legs when lifting). Obey sensible lifting limits (60 pounds individual lifting maximum). Use mechanical lifting equipment to move large, awkward loads.
	Slips, trips and falls	Clear walkways of equipment, vegetation, and excavated material. Maintain good housekeeping.
	Pinch-points/Cut hazards	Keep hands, fingers, and feet clear of moving/suspended materials and equipment. Wear adequate hand protection.
Delivery of chemical to injector	Chemical exposure	Train workers on the hazards associated with site chemicals. Applicable MSDS sheets will be reviewed by all employees working with chemicals. Chemical mixing and injection equipment-specific training is required. Ensure proper flow pathways. Open valves slowly. Label piping to identify chemical contents and the associated hazards. Identify flow directions on piping. Use lock out/tagout procedures to modify plumbing.
	Incompatible chemicals	Ensure that piping is clear of other chemicals and/or debris prior to transferring chemicals. Fire extinguishers (water media) shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition. Spill containment measures shall be readily available to contain spill and prevent chemical mixing and/or migration off-site.
	Heavy lifting	Use proper lifting techniques (flex at the knees and use legs when lifting). Obey sensible lifting limits (60 pounds individual lifting maximum). Use mechanical lifting equipment to move large, awkward loads.
	Slips, trips and falls	Clear walkways of equipment, vegetation, and excavated material. Maintain good housekeeping.
	Pinch-points/Cut Hazards	Keep hands, fingers, and feet clear of moving/suspended materials and equipment. Wear adequate hand protection.

ACTIVITY HAZARD ANALYSIS
Chemical Mixing and Injection

Page 3 of 3

Principal Steps	Potential Hazards	Recommended Controls
Delivery of chemical to injector (Continued)	Hot/Cold Stress	Train workers to recognize symptoms of hot and cold stress. Implement IT Procedures HS400 and HS401 as appropriate. Instruct workers using impermeable clothing to have extra dry clothes to change into.
Equipment to be used	Inspection Requirements	Training Requirements
PPE	Pre- and post-maintenance Visual inspection prior to use CESPD Form 150R	Hazards communication Chemical mixing and ejection equipment-specific training required Tailgate Safety Meeting Site specific orientation Hazardous waste operations

ACTIVITY HAZARD ANALYSIS
Soil/Water Sampling

Page 1 of 2

Principal Steps	Potential Hazards	Recommended Controls
Staging Equipment	Slip, trip, and fall hazards	Maintain good housekeeping, keep work area picked up and as clean as feasible. Continually inspect the work area for slip, trip, and fall hazards.
	Heavy lifting	Use proper lifting techniques. Lifts greater than 60 pounds require assistance or mechanical equipment; size-up the lift.
	Falling objects	Stay alert and clear of materials suspended overhead. Use steel-toed boots and hard hat.
	Flying debris, dirt, dust, etc.	Use safety glasses/goggles. Ensure that eye wash is in good working order.
	Pinch points	Keep hands, fingers, and feet clear of moving/suspended materials and equipment.
	Fire	Fire extinguishers shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition.
	Fire/chemical exposure	All solvents will be transported in UL/FM-approved containers and sources of ignition will be prohibited. Initial real time air monitoring will take place.
	Contact with moving equipment/vehicles	Work area will be barricaded/demarcated.
	Work in excavations	IT Policy and Procedure HS 307, "Excavation and Trenching," will be adhered to at all times.
	Hazard communication	Label all containers as to contents and dispose of property.
	Noise	Sound levels above 85 dBA mandates hearing protection.
Sample collection	Working at elevated heights/falls	Ladders will be secured by top, bottom, and intermediate fastenings, as required. Personnel working at heights of 6 feet or more must be secured with fall protection (safety belt/lanyard).
	Electrical shock	All electrical circuits will be de-energized and locked out.
	Cross-contamination and contact with potentially contaminated materials	Sampling technicians will wear proper protective clothing and equipment to safeguard against potential contamination. Initial real-time air monitoring will take place before and during sampling activities. All liquids and materials used for decontamination will be contained and disposed of in accordance with federal, state, and local regulations.
	Cut hazards	Wear adequate hand protection.
	Hazard communication	Label all containers as to contents.
	Strains/sprains	Avoid twisting/turning while pulling on tools, grates, manway covers, etc.

ACTIVITY HAZARD ANALYSIS
Soil/Water Sampling

Page 2 of 2

Principal Steps	Potential Hazards	Recommended Controls
Sample collection	Spills/residual materials	Absorbent material and containers will be kept where leaks or spills may occur.
	Lighting	Adequate lighting will be provided to insure a safe working environment.
	Unattended worker	"Buddy System" - visual contact will be maintained with the sampling technician during sampling activities.
	Confined spaces	IT Policy and Procedure HS300, "Confined Spaces," will be adhered to at all times.
	Contact with potentially contaminated materials	Real-time air monitoring will take place. Appropriate PPE will be utilized. IT Policy and Procedure HS501, "Respiratory Protective Devices," will be adhered to at all times.
Equipment decontamination	Chemical exposure	Maintain MSDSs for all chemicals such as methanol or hexane and follow protection procedures.
On-site sample analysis	Various	On-site laboratory will develop and adhere to a site-specific chemical hygiene plan (CHP). The CHP will be submitted to the Program CIH for review and acceptance.
Moving and shipping collected samples	Heavy lifting	Use proper lifting techniques. Lifts greater than 50 pounds require assistance or mechanical equipment; size-up the lift.
Moving and shipping collected samples	Pinch points	Keep hands, fingers, and feet clear of moving/suspended materials and equipment.
	Cut hazards	Wear adequate hand protection. Use care when handling glassware.
	Hazard communication	Label all containers as to contents and associated hazards.
Equipment to be used	Inspection Requirements	Training Requirements
Hand tools PPE Sampling equipment	Pre-postmaintenance Visual prior to use	Tailgate Safety Meeting Site-specific orientation Hazardous waste operations Hazard communication

ACTIVITY HAZARD ANALYSIS
Well Drilling, Installation, and Monitoring

Page 1 of 2

Activity	Hazards	Control Measures
Drill Rig Operations	Jacks/Outriggers	Outrigger will be extended per the manufacturer's specifications.
	Hoists	Hoists will be used only for their designed intent and will not be loaded beyond their rated capacity. Steps will be taken to prevent two-blocking of hoists.
		Dress rods will be neither run nor rotated through rod slipping devices. No more than one foot of drill rod column will be hoisted above the top of the drill mast. Drill rod tool joints will not be made up, tightened, or loosened while the rod column is supported by a rod slipping device.
	Whip lines & cables	Stand clear when under tension
	Fire	Have fire extinguishers inspected and readily available.
		Real time air monitoring will take place for LEL/O ₂
	Noise	Hearing protection is mandatory and above 85dbA.
	Contact with rotating or reciprocating machine parts	Machine guards, use long-handled shovels to remove auger cuttings.
		Safe lockout procedures for maintenance work.
	Heavy lifting	Use proper lifting techniques. Lifts greater than 60lbs. Require assistance or mechanical equipment size-up the lift. Recommend wearing a back support if possible.
	Slip, trip and fall hazards	Good housekeeping, keep work area picked up and clean as feasible. Continually inspect the work area for slip, trip and fall hazards. Assure no holes in walkways exist that are greater than 12" x 12".
	Contact with potentially contaminated materials and poison oak	Real time air monitoring will take place. If necessary, proper personal protective clothing and equipment will be utilized. Modified "D" will be the lowest level of protection due to the high potential for skin contact.
	Auger binding or breaking	Auger guides will be used on hard services.
Drill Rig Operations	Contact with potentially contaminated materials	Utilize appropriate PPE.
	Special conditions	Climbing booms, or any hazardous operations out of the normal use of drill will not be conducted without approval of SSHO.
	Fall hazards	Use safety full-body harness, shock absorbing lanyard with double locking hooks, an lifeline when working above 6 feet. Open bore holes will be capped and flagged. Open excavations will be barricaded.

ACTIVITY HAZARD ANALYSIS
Well Drilling, Installation, and Monitoring

Page 2 of 2

Equipment to be used	Inspection Requirements	Training Requirements
Hand tools PPE Heavy equipment Drilling rig Service truck	Pre-postmaintenance Visual prior to use	Tailgate Safety Meeting Site specific orientation Hazardous waste operations Hazard communication

ACTIVITY HAZARD ANALYSIS
Chemical Spill/Emergency Response

Page 1 of 3

Principal Steps	Potential Hazards	Recommended Controls
Preparation of dry chemicals	Chemical burns from exposure to chemical oxidizers and acids.	<p>Train workers on the hazards associated with site chemicals. Applicable MSDS sheets will be review by all employees working with chemicals.</p> <p>Transfer materials slowly to prevent splashing/dust.</p> <p>PPE – Safety glasses, face shield, chemical resistant clothing, hard-toed shoes with rubber covers, and rubber gloves.</p> <p>Label containers to identify the chemical contents, and the associated hazards.</p>
	Fire/explosion	<p>Ensure that containers are clear of other chemicals and/or debris prior to transferring chemicals.</p> <p>Cover containers after filling to prevent contamination due to the elements.</p> <p>Fire extinguishers (water media) shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition.</p>
	Spills/Leaks	Spill containment measures shall be readily available to contain spill and prevent chemical mixing and/or migration off-site.
	Heavy lifting	<p>Use proper lifting techniques (flex at the knees and use legs when lifting).</p> <p>Obey sensible lifting limits (60 pounds individual lifting maximum).</p> <p>Use mechanical lifting equipment to move large, awkward loads.</p>
	Slips, trips and falls	<p>Clear walkways of equipment, vegetation, and excavated material.</p> <p>Maintain good housekeeping.</p>
	Pinch-points/Cut Hazards	<p>Keep hands, fingers, and feet clear of moving/suspended materials and equipment.</p> <p>Wear adequate hand protection.</p>
	Heavy equipment operations	<p>Inspect all heavy equipment before use.</p> <p>Only trained, experienced operators may operate equipment.</p> <p>All ground personnel will be prohibited from working in areas while heavy equipment is in use.</p> <p>All heavy equipment must be equipped with roll-over protection systems (ROPS) and backup alarms.</p> <p>Seat belts will be worn while operating equipment.</p>
	Contact with moving equipment/vehicles	Work area will be barricaded/demarcated.
	Hot/Cold Stress	<p>Train workers to recognize symptoms of hot and cold stress.</p> <p>Implement IT Procedures HS400 and HS401 as appropriate.</p> <p>Instruct workers using impermeable clothing to have extra dry clothes to change into.</p>

ACTIVITY HAZARD ANALYSIS
Chemical Spill/Emergency Response

Page 2 of 3

Principal Steps	Potential Hazards	Recommended Controls
Dilution of chemicals	Chemical exposure	<p>Train workers on the hazards associated with site chemicals. Applicable MSDS sheets will be review by all employees working with chemicals.</p> <p>Perform visual inspection of containers for contents and sign of contamination prior to use.</p> <p>Add diluant (water) to the container before chemicals.</p> <p>Transfer materials slowly to prevent splashing.</p> <p>PPE – Safety glasses, face shield, chemical resistant clothing, hard-toed shoes with rubber covers, and rubber gloves.</p> <p>Label tanks to identify the chemical contents, and the associated hazards.</p>
	Fire/explosion	<p>Dilute concentrated chemicals by adding to water, not by adding water to the concentrated chemical</p> <p>In the event of a spill, berm off the area, and dilute the chemical with water (Consult spill dilution procedures in Appendix A).</p> <p>Ensure that containers are clear of other chemicals, debris and/or water prior to transferring chemicals.</p> <p>Cover containers after filling to prevent contamination due to the elements.</p> <p>Fire extinguishers (water media) shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition.</p>
	Spills/leaks	<p>Spill containment measures shall be readily available to contain spill and prevent chemical mixing and/or migration off-site.</p>
Neutralization of oxidizer solutions (KMnO ₄ and H ₂ O ₂)	Fire/Explosion	<p>Dilute all oxidizer solutions to 5% or less (consult dilution procedures in Appendix A) prior to chemical neutralization.</p> <p>Always neutralize with dilute solutions (10%) of reducing agent (NaHSO₃); NEVER add solid reducing agent directly to any oxidizer solution.</p> <p>Train workers on the hazards associated with site chemicals. Applicable MSDS sheets will be review by all employees working with chemicals.</p> <p>Transfer materials slowly to prevent splashing.</p> <p>PPE – Safety glasses, face shield, chemical resistant clothing, hard-toed shoes with rubber covers, and rubber gloves.</p> <p>Label containers to identify the chemical contents, and the associated hazards.</p>
	Chemical exposure	<p>If possible, dilute concentrated chemicals by adding to water, not by adding water to the concentrated chemical. If not possible, use Extreme Care when diluting.</p> <p>In the event of a spill, berm off the area, and dilute the chemical with water (Consult spill dilution procedures in Appendix A).</p>

ACTIVITY HAZARD ANALYSIS
Chemical Spill/Emergency Response

Principal Steps	Potential Hazards	Recommended Controls
Neutralization of oxidizer solutions (Continued)	Fire/Explosion (Continued)	<p>Ensure that containers are clear of other chemicals and/or debris prior to transferring chemicals.</p> <p>Cover tanks after filling to prevent contamination due to the elements.</p> <p>Fire extinguishers (water media) shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition.</p> <p>Spill containment measures shall be readily available to contain spill and prevent chemical mixing and/or migration off-site.</p>
Neutralization of chemical solutions (FeSO ₄ , HCl, and NaHSO ₃)	Fire/Explosion	<p>Ensure that containers are clear of other chemicals and/or debris prior to transferring chemicals.</p> <p>Cover tanks after filling to prevent contamination due to the elements.</p> <p>Fire extinguishers (water media) shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition.</p> <p>Spill containment measures shall be readily available to contain spill and prevent chemical mixing and/or migration off-site.</p>
	Chemical exposure	<p>Train workers on the hazards associated with site chemicals. Applicable MSDS sheets will be reviewed by all employees working with chemicals.</p> <p>Dilute chemical solutions prior to performing neutralizing procedures.</p> <p>Never add dry chemical reagent directly. Add the water slowly, to prevent splashing. Rapid addition could result in uncontrolled reactions, generating toxic fumes and potentially leading to fire, or explosion.</p> <p>Neutralize acid solutions with sodium bicarbonate (baking soda). See Appendix A for details.</p> <p>Recover and containerize (FeSO₄, HCl, and NaHSO₃) solutions to the extent possible. Flush area with potable water. See Appendix A for details.</p> <p>PPE – Safety glasses, face shield, chemical resistant clothing, hard-toed shoes with rubber covers, and rubber gloves.</p> <p>Label tanks to identify the chemical contents, and the associated hazards.</p>
Neutralization of chemical solutions (FeSO ₄ , HCl, and NaHSO ₃)	Heavy lifting	<p>Use proper lifting techniques (flex at the knees and use legs when lifting).</p> <p>Obey sensible lifting limits (60 pounds individual lifting maximum).</p> <p>Use mechanical lifting equipment to move large, awkward loads.</p>
	Slips, trips and falls	<p>Clear walkways of equipment, vegetation, and excavated material.</p> <p>Maintain good housekeeping.</p>
	Pinch-points/Cut Hazards	<p>Keep hands, fingers, and feet clear of moving/suspended materials and equipment.</p> <p>Wear adequate hand protection.</p>

ACTIVITY HAZARD ANALYSIS
Site Restoration

Page 1 of 1

Activity	Hazard	Controls/Measures
Site restoration	Areas on or adjacent to contaminated material	Implement appropriate level of protection. A lockout/tagout procedure shall be used for equipment found to be faulty or undergoing maintenance. Bulldozer and scraper blades, end-loader buckets, and similar equipment will be either fully lowered or blocked when being repaired or when not in use. All self-propelled construction equipment shall be equipped with a back-up alarm.
	Fire	Each bulldozer, backhoe, or other similar equipment will be equipped with at least one dry chemical fire extinguisher having a minimum UL rating of 1A5BC.
	Open excavations	IT Policy and Procedure HS307 "Excavation and Trenching" will be adhered to at all times. Excavations will be backfilled as soon as possible.
	Dump truck operations	Dump truck bodies shall be fully lowered or blocked when maintenance is being performed or when not in use. A signal person will be used when the point of operation is not in full view of the vehicle, machine or equipment operator; vehicles are backed more than 100 ft; terrain is hazardous; or 2 or more vehicles are backing in the same area.
	Contact with moving equipment	Ground personnel shall wear reflective vests.
	Noise	Noise levels above 85 dBA mandate the use of hearing protection
Final Grading	Noise hazards	Administer hearing protection.
	Heavy equipment, travel	Use qualified operators.
	Mechanical moving parts, pinch, paint, etc.	Have all grounding in place. Use lockout/tagout for maintenance. Assure all emergency stop switches are working.
Equipment	Inspection	Training
Hand tools PPE Sampling equipment	Pre-postmaintenance Visual prior to use	Tailgate Safety Meeting Site specific orientation Hazardous waste operations Hazard communication

ACTIVITY HAZARD ANALYSIS
Decontamination of Equipment

Page 1 of 5

Activity	Potential Hazards	Recommended Controls
Job setup for decontamination of equipment	Heavy lifting	Use proper lifting techniques. Lifts greater than 60 lbs. require assistance or mechanical equipment; size-up the lift. Recommend wearing a back support if possible
	Slips, trips, and fall hazards	Good housekeeping, keep work area picked up and as clean as feasible. Continually inspect the work area for slip, trip, and fall hazards.
	Cut hazards	Wear adequate hand protection
	Lighting	Adequate lighting will be provided to ensure a safe working environment.
	Strains/sprains	When pulling of lifting, do not turn or twist your back. Use the proper tool for the task being performed.
	Contact with potentially contaminated materials	Appropriate PPE protection will be required. Real-time air monitoring will take place during decontamination activities. Keep airborne particulates to a minimum. Practice good housekeeping, avoid spreading potentially contaminated materials.
	Fueling	Only UL/FM approved safety cans shall be used to store fuel. Do not refuel equipment while it is operating. Fire extinguishers rated at A/B/C shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition.
	Faulty or damaged equipment	Before any machinery or mechanized equipment is placed into service, it shall be inspected and tested by a competent mechanic and certified to be in safe operating condition. Equipment shall be inspected before being placed into service and at the beginning of each shift. Preventive maintenance procedures recommended by the manufacturer shall be followed. A lockout-tagout procedure shall be used for equipment found to be faulty or undergoing maintenance.
Pressure washing equipment	High pressure	IT Policy and Procedure HS303 "Pressured water cleaning and cutting equipment" shall be adhered to at all times. The operator shall be thoroughly instructed in handling and operating the gun, nozzle and controls prior to operating the unit. The operator shall wear metatarsal covers (guards) at all times. At no time shall the pressure washer be used to wash/decon personnel.

ACTIVITY HAZARD ANALYSIS
Decontamination of Equipment

Page 2 of 5

Activity	Potential Hazards	Recommended Controls
Pressure washing equipment (Continued)	Unqualified operators	Machinery and mechanized equipment shall be operated only by designated personnel.
	Out of control equipment	Machinery or equipment requiring an operator shall not be permitted to run unattended. Machinery or equipment will not be operated in a manner that will endanger persons or property not will the safe operating speeds or loads be exceeded.
	Noise	Sounds levels above 85 dBA mandates hearing protection.
	Activation during repairs	All machinery or equipment will be shut down and positive means taken to prevent its operation while repairs or manual lubrications are being done.
	Pinch points	Keep feet and hands clear of moving/suspended materials and equipment. Stay alert at all times!
	Falling objects	Hardhats, remove unsecured tools and materials before operating equipment. Stay alert and clear of materials suspended overhead.
	Flying debris	Splash shield will be used.
	Contact with potentially contaminated materials	Appropriate PPE will be required.
	Hot work (hot water/stream cleaning)	IT Policy and Procedure HS314 "Hot Work in Hazardous Locations" will be adhered to at all time during any operations involving hot work.
Stage-setup equipment for pumping liquids	Pinch points	Keep hands, fingers, and feet clear of moving parts.
	Heavy lifting	Any lifting over 60 lbs. Requires assistance or the use of a mechanical lifting device.
	Moving equipment	Signal person will assist in positioning equipment.
	Contact with potentially contaminated materials	Real time air monitoring will take place. Appropriate PPE protection will be required.
Pumping liquids	Faulty equipment	Equipment will be inspected prior to being placed into service and at the beginning of each shift.
	Pressurized systems	All discharge hoses and connections shall be routinely inspected.
	Noise	Sound levels above 85 dBA mandates hearing protection.
	Fire	A dry chemical fire extinguisher with a rating of A/B/C will be readily available.

ACTIVITY HAZARD ANALYSIS
Decontamination of Equipment

Page 3 of 5

Activity	Potential Hazards	Recommended Controls
Pumping liquids (Continued)	Refueling	Proper bonding and grounding. Only UL/FM approved safety cans will be used.
	Heavy equipment operations	<p>Before any machinery or mechanized equipment is placed into service, it shall be inspected and tested by a competent mechanic and certified to be in safe operating condition.</p> <p>Equipment shall be inspected before being placed into service and at the beginning of each shift.</p> <p>Preventive maintenance procedures recommended by the manufacturer shall be followed.</p> <p>A lockout-tagout procedure shall be used for equipment found to be faulty or undergoing maintenance.</p>
Loadout of equipment		Machinery and mechanized equipment shall be operated only by designated personnel.
		Getting on or off any equipment while it is in motion is prohibited.
		Machinery or equipment requiring an operator shall not be permitted to run unattended.
		Machinery or equipment will not be operated in a manner that will endanger persons or property nor will the safe operating speeds or loads be exceeded.
		All machinery or equipment will be shutdown and positive means taken to prevent its operation while repairs or manual lubrications are being done.
		All repairs on machinery or equipment will be made at a location which provides protection from traffic for repair persons.
		All self-propelled construction equipment shall be equipped with a back-up alarm.
	Fire	Each bulldozer, backhoe, or other similar equipment will be equipped with at least one dry chemical fire extinguisher having an A/B/C rating.
	Truck and equipment traffic	<p>Site personnel will wear orange safety vests to identify themselves to traffic.</p> <p>Load out area will be properly demarcated. Ground personnel to make eye contact with equipment/vehicle operators prior to traffic zone entry. Ground personnel will avoid blind spots directly in front of and directly behind equipment/vehicles.</p>
	Slip, trip, and fall hazards	Good housekeeping, keep work area picked up and as clean as feasible. Continually inspect the work area for slip, trip, and fall hazards. Look where you step, ensure safe footing when climbing on/off equipment etc.

ACTIVITY HAZARD ANALYSIS
Decontamination of Equipment

Activity	Potential Hazards	Recommended Controls
Loadout of equipment (Continued)	Pinch points	Keep feet and hands clear of moving/suspended materials and equipment. Beware of contact points. Stay alert at all times!
	Strains/sprains	Use proper lifting techniques. Lifts greater than 60 lbs. require assistance or mechanical equipment. Size up the lift. When pulling on materials, pull in a straight line. Do not twist and pull simultaneously.
	Ropes, slings, chains, and hooks	The use of ropes, slings and chains shall be in accordance with the safe recommendations of their manufacturer.
		Rigging equipment shall not be loaded in excess of its recommended safe working load.
		The use of open hooks is prohibited in rigging to lift any load where there is danger of relieving the tension on the hook due to the load or hook catching or fouling.
		Hooks, shackles, rings, pad eyes, and other fittings that show excessive wear or that have been bent, twisted, or otherwise damaged shall be removed from service.
		Rigging equipment for material handling shall be inspected prior to use on each shift and as necessary during its use to insure that it is safe. Defective rigging equipment shall be removed from service.
		Rigging equipment, when not in use, shall be removed from the immediate work area and properly stored so as not to present a hazard.
		Taglines shall be used to control the loads being handled by hoisting equipment.
	Hoisting equipment	All hoisting equipment shall be capable of passing a performance (operating) test prior to being placed into service.
		At no time shall the hoisting equipment be loaded in excess of the manufacturers rating except during performance tests.
		While hoisting equipment is in operation, the operator shall not perform any other work and he/she shall not leave his/her position at the controls until the load has been safely landed or returned to the ground.
		A standard signal system shall be used on all hoisting equipment.
	Heat	Be aware of warning signs of these conditions.
	Insects, spiders, and snakes	Inspect work area carefully and avoid placing hands and feet into concealed areas.
	Cut hazards	Wear adequate hand protection.

ACTIVITY HAZARD ANALYSIS
Decontamination of Equipment

Page 5 of 5

Activity	Potential Hazards	Recommended Controls
Loadout of equipment (Continued)	Falling objects	Hardhat, stay alert and clear of materials suspended overhead, steel-toed boots.
Equipment to be used	Inspection Requirements	Training Requirements
Hand tools PPE Heavy Equipment Pressure Washer	Pre-postmaintenance Visual prior to use CESPD Form 150 R	Tailgate Safety Meeting Site specific orientation Hazardous waste operations Hazard communication Pressure washer training

ACTIVITY HAZARD ANALYSIS
Clearing and Grubbing of Vegetation

Page 1 of 3

Principal Steps	Potential Hazards	Recommended Controls
Clearing brush and debris	Slip, trip, and fall hazards	Individuals must survey the terrain and look before stepping.
	Sharp objects	Individuals must be alert to sharp objects that may be lying under brush. Metal inserts may be used inside boots to make them puncture resistant.
	Poisonous plants, snakes, and insects	Individuals must be aware of the potential for these hazards to be present. Precautionary measures to be taken will be addressed in daily tailgate safety meetings.
	Use of machetes	Keep other personnel clear of swing area. Use extreme caution when using.
	Heavy lifting	Use proper lifting techniques. Lifts greater than lbs. require assistance or mechanical equipment; size up the lift.
	Pinch points	Keep hands, fingers, and feet clear of moving/suspended materials and equipment.
	Falling objects	Hardhat, stay alert and clear of materials suspended overhead; steel-toed boots.
	Flying debris, dirt, dust, etc.	Safety glasses/eye wash.
	Faulty or damaged equipment	Before any machinery or mechanized equipment is placed into service, it shall be inspected and tested by a competent mechanic and certified to be in safe operating condition.
		Equipment shall be inspected before being placed into service and at the beginning of each shift.
		Preventative maintenance procedures recommended by the manufacturer shall be followed.
		A lockout-tagout procedure shall be used for equipment found to be faulty or undergoing maintenance.
	Unqualified operators	Machinery and mechanized equipment shall be operated only by designated personnel.
Heavy equipment operations	Out of control equipment	Getting off or on any equipment while it is in motion is prohibited.
		Machinery or equipment requiring an operator shall not be permitted to run unattended

ACTIVITY HAZARD ANALYSIS
Clearing and Grubbing of Vegetation

Page 2 of 3

Principal Steps	Potential Hazards	Recommended Controls
Heavy equipment operations	Out of control equipment	Machinery or equipment will not be operated in a manner that will endanger persons or property nor will the safe operating speeds or loads be exceeded.
	Noise	Sound levels above 85 dBA mandates hearing protection.
	Activation during repairs	All machinery or equipment will be shut down and positive means taken to prevent its operation while repairs or manual lubrications are being done.
		All repairs on machinery or equipment will be made at a location that provides protection from traffic for repair persons.
		Bulldozer and scraper blades, end-loader buckets, and similar equipment will be either fully lowered or blocked when being repaired or when not in use.
	Faulty or damaged equipment	Before any machinery or mechanized equipment is placed into service, it shall be inspected and tested by a competent mechanic and certified to be in safe operating condition.
	Movement of equipment	All self-propelled construction equipment shall be equipped with a back-up alarm.
	Fire	Each bulldozer, backhoe, or other similar equipment will be equipped with at least one dry chemical fire extinguisher having a minimum UL rating of 1A5BC.
		Keep areas of equipment reasonably free from accumulation of oil, fuel, or other material.
	Contact with potentially contaminated materials	Real-time air monitoring will take place. If necessary, proper personal protective clothing and equipment will be utilized.
	Uneven terrain and poor ground support	Inspections or determinations of road conditions and structures shall be made in advance to assure that clearances and load capacities are safe for the passage or placing of any machinery or equipment.

ACTIVITY HAZARD ANALYSIS
Clearing and Grubbing of Vegetation

Page 3 of 3

Equipment to be Used	Inspection Requirements	Training Requirements
Chainsaw Machette Heavy equipment PPE	Pre-post maintenance Visual prior to use CESPD Form 150 R	Tailgate safety meeting Site-specific orientation Hazardous waste operations Hazard communication Chainsaw operations

ACTIVITY HAZARD ANALYSIS
Waste Management

Page 1 of 3

Principal Steps	Potential Hazards	Recommended Controls
Containerizing of Waste	Chemical exposure	Transfer chemicals in well-ventilated area. Use appropriate PPE for chemical hazards. Refer to specific MSDS. Ensure proper/ compatible containers are used for chemicals.
	Improper or missing labels	Visually inspect all chemical storage containers for proper labeling. Prepare and attach completed labels at start of accumulation of waste into container. Ensure hazards classification profile is generated for each waste stream.
	Contact between incompatible chemicals	Ensure compatibility with other chemical components, if combination of waste streams is required. Consult the MSDS.
	Noise	Noise protection shall be worn when working with heavy equipment.
Transfer waste from point of generation to storage facility	Heavy Lifting	Use proper lifting techniques (flex at the knees and use legs when lifting). Obey sensible lifting limits (60 pounds individual lifting maximum). Use mechanical lifting equipment to move large, awkward loads.
	Slips, trips and falls	Clear walkways of equipment, vegetation, and excavated material. Maintain good housekeeping.
	Heavy equipment operations	Inspect all heavy equipment before use. Only trained, experienced operators may operate equipment. All ground personnel will be prohibited from working in areas while heavy equipment is in use. All heavy equipment must be equipped with roll-over protection systems (ROPS) and backup alarms. Seat belts will be worn while operating equipment. Noise protection shall be worn when working with heavy equipment.
	Noise	Noise protection shall be worn when working with heavy equipment.
	Contact with moving equipment/vehicles	Work area will be barricaded/demarcated.
	Fire	Fire extinguishers shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition. Fires involving the storage chemicals should be extinguished with water.
Segregation of wastes	Fire/Chemical exposure	Refer to map layout of Hazardous Waste Storage Area. Refer to Appendix A for Emergency/Spill Response Procedures.

ACTIVITY HAZARD ANALYSIS
Waste Management (Continued)

Principal Steps	Potential Hazards	Recommended Controls
Segregation of wastes (Continued)	Contact between incompatible chemicals	Segregate chemicals in accordance with hazards described in the MSDS.
	Improper or missing labels	Visually inspect all chemical storage containers for proper labeling.
Transfer of waste to shipping vessel	Chemical exposure	<p>Train workers on the hazards associated with site chemicals. Applicable MSDS sheets will be review by all employees working with chemicals.</p> <p>Transfer materials slowly to prevent splashing.</p> <p>PPE – Safety glasses, face shield, chemical resistant clothing, hard-toed shoes with rubber covers, and rubber gloves.</p> <p>Label tanks to identify the chemical contents, and the associated hazards.</p> <p>Containment/clean-up material will be made readily available in event of spill</p>
	Fire	<p>Ensure that containers are clear of other chemicals and/or debris prior to transferring chemicals.</p> <p>Cover containers after filling to prevent contamination due to the elements.</p> <p>Fire extinguishers (water media) shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition.</p> <p>Spill containment measures shall be readily available to contain spill and prevent chemical mixing and/or migration off-site.</p>
	Skin, eye and respiratory irritation	<p>Transfer materials slowly to minimize airborne distribution.</p> <p>PPE – Safety glasses, chemical resistant clothing, hard-toed shoes, and rubber gloves.</p>
	Heavy lifting	<p>Use proper lifting techniques (flex at the knees and use legs when lifting).</p> <p>Obey sensible lifting limits (60 pounds individual lifting maximum).</p> <p>Use mechanical lifting equipment to move large, awkward loads.</p>
	Slips, trips and falls	<p>Clear walkways of equipment, vegetation, and excavated material.</p> <p>Maintain good housekeeping.</p>
	Pinch-points/Cut Hazards	<p>Keep hands, fingers, and feet clear of moving/suspended materials and equipment.</p> <p>Wear adequate hand protection.</p>

ACTIVITY HAZARD ANALYSIS
Waste Management (Continued)

Page 3 of 3

Principal Steps	Potential Hazards	Recommended Controls
Transfer of waste to shipping vessel (Continued)	Heavy equipment operations	<p>Inspect all heavy equipment before use.</p> <p>Only trained, experienced operators may operate equipment.</p> <p>All ground personnel will be prohibited from working in areas while heavy equipment is in use.</p> <p>All heavy equipment must be equipped with roll-over protection systems (ROPS) and backup alarms.</p> <p>Seat belts will be worn while operating equipment.</p>
	Contact with moving equipment/vehicles	Work area will be barricaded/demarcated.
	Hot/Cold Stress	<p>Train workers to recognize symptoms of hot and cold stress. Implement IT Procedures HS400 and HS401 as appropriate.</p> <p>Instruct workers using impermeable clothing to have extra dry clothes to change into.</p>
	Incompatible chemicals	<p>Fire extinguishers (water media) shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition.</p> <p>Spill containment measures shall be readily available to contain spill and prevent chemical mixing and/or migration off-site.</p> <p>Ensure compatibility with other chemical components, if combination of waste streams is required. Consult the MSDS and technical staff.</p>
Equipment to be used	Inspection Requirements	Training Requirements
<p>Forklift</p> <p>Drum Dolly</p> <p>PPE</p>	<p>Pre- and post-maintenance</p> <p>Visual inspection prior to use</p> <p>CESPD Form 150R</p>	<p>Hazcom</p> <p>Tailgate Safety Meeting</p> <p>Site specific orientation</p>

APPENDIX D
PROPOSITION 65 NOTICE AND MATERIAL SAFETY DATA SHEETS

PROPOSITION 65 WARNING AND NOTIFICATION EXAMPLE

As required under the Safe Drinking Water and Toxic Enforcement Act of 1986 (also known as Proposition 65), on February 27, 1987, the Governor published a listing of those chemicals determined by the State of California to cause cancer, birth defects, or other reproductive harm. Proposition 65 requires that businesses that handle any of the listed chemicals notify people in the affected area of that fact. IT Corporation anticipates handling some of the listed chemicals at the Hunters Point Shipyard in San Francisco, California.

The chemicals present on site that have been determined to cause cancer include:

- 1,1-Dichloroethane
- 1,2-Dichloropropane
- Hetachlor epoxide
- Hexachloroethane
- Tetrachloroethylene
- Trichloroeththylene
- Vinyl Chloride

The following contaminants on site have been determined by the State to cause reproductive harm:

- Methyl Chloride

ONCOR -- SODIUM BISULFITE
MATERIAL SAFETY DATA SHEET
NSN: 655000F051079
Manufacturer's CAGE: 016E9
Part No. Indicator: A
Part Number/Trade Name: SODIUM BISULFITE

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General Information

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Company's Name: ONCOR INC
Company's Street: 209 PERRY PKY SUITE 7
Company's City: GAITHERSBURG
Company's State: MD
Company's Country: US
Company's Zip Code: 20877-5000
Company's Emerg Ph #: 301-963-3500/800-776-6267
Company's Info Ph #: 301-963-3500/800-776-6267
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SE
Date MSDS Prepared: 25MAR92
Safety Data Review Date: 23SEP96
Preparer's Company: ONCOR INC
Preparer's St Or P. O. Box: 209 PERRY PKY SUITE 7
Preparer's City: GAITHERSBURG
Preparer's State: MD
Preparer's Zip Code: 20877-5000
MSDS Serial Number: CCDNQ

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Ingredients/Identity Information

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Proprietary: NO
Ingredient: SODIUM BISULFITE
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: VZ2000000
CAS Number: 7631-90-5
ACGIH TLV: 5 MG/CUM

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Physical/Chemical Characteristics

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Appearance And Odor: WHITE CRYSTALS/POWDER.
Specific Gravity: 1.48

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Fire and Explosion Hazard Data

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Extinguishing Media: DRY CHEMICAL POWDER.
Special Fire Fighting Proc: WEAR SCBA & PROTECTIVE CLOTHING.
Unusual Fire And Expl Hazrds: EMITS TOXIC FUMES UNDER FIRE CONDITIONS.

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Reactivity Data

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Stability: YES
Materials To Avoid: STRONG ACIDS, STRONG OXIDIZING AGENTS.
Hazardous Decomp Products: COMBUSTION: SULFUR OXIDES.
Hazardous Poly Occur: NO

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Health Hazard Data

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Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: HARMFUL IF SWALLOWED, INHALED/ABSORBED
THROUGH SKIN. MATERIAL IS EXTREMELY DESTRUCTIVE TO TISSUE OF THE MUCOUS
MEMBRANES & UPPER RESPIRATORY TRACT, EYES & SKIN. INHALATION: FATAL AS A
RESULT OF SPASM, INFLAMMATION & EDEMA OF THE LARYNX & BRONCHI, CHEMICAL
PNEUMONITIS & PULMONARY EDEMA.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NONE
Signs/Symptoms Of Overexp: BURNING SENSATION, COUGH, WHEEZING, LARYNGITIS,
SHORTNESS OF BREATH, HEADACHE, NAUSEA, VOMITING.
Med Cond Aggravated By Exp: ASTHMA
Emergency/First Aid Proc: EYES/SKIN: FLUSH W/WATER FOR 15 MINS.
INHALATION: REMOVE TO FRESH AIR. GIVE CPR/OXYGEN IF NEEDED. INGESTION: WASH
OUT MOUTH W/WATER PROVIDED PERSON IS CONSCIOUS. OBTAIN MEDICAL ATTENTION IN
ALL CASES.
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Precautions for Safe Handling and Use

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Steps If Matl Released/Spill: EVACUATE AREA. WEAR SCBA, RUBBER BOOTS &
HEAVY RUBBER GLOVES. ABSORB ON SAND/VERMICULITE & PLACE IN CLOSED
CONTAINERS FOR DISPOSAL. VENTILATE AREA & WASH SITE AFTER MATERIAL PICKUP
IS COMPLETE.
Waste Disposal Method: SMALL: CAUTIOUSLY ADD TO LARGE STIRRED EXCESS OF
WATER. ADJUST THE PH TO NEUTRAL, SEPARATE ANY INSOLUBLE SOLIDS/LIQUIDS &
PACKAGE THEM FOR HAZARDOUS WASTE DISPOSAL. FLUSH THE AQUEOUS SOLUTION DOWN
THE DRAIN W/PLENTY OF WATER. (SEE SUPP)
Precautions-Handling/Storing: STORE AT ROOM TEMPERATURE IN A DRY LOCATION.
WEAR LABORATORY APRONS/APPROVED CLOTHING & GLOVES.
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Control Measures

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Respiratory Protection: WEAR NIOSH/MSHA APPROVED RESPIRATOR.
Ventilation: CHEMICAL FUME HOOD.
Protective Gloves: CHEMICAL RESISTANT
Eye Protection: FULL PROTECTION GOGGLES
Work Hygienic Practices: REMOVE/LAUNDER CONTAMINATED CLOTHING BEFORE
REUSE. DISCARD CONTAMINATED SHOES.
Suppl. Safety & Health Data: WASTE CONT'D: THE HYDROLYSIS & NEUTRALIZATION
REACTIONS MAY GENERATE HEAT & FUMES WHICH CAN BE CONTROLLED BY THE RATE OF
ADDITION. DISPOSE OF IAW/FEDERAL, STATE & LOCAL REGULATIONS.
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Transportation Data

Disposal Data

Label Data

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CAROLINA BIOGOLICAL SUPPLY -- 88-4130(500G) POTASSIUM PERMANGANATE -
POTASSIUM PERMANGANATE,ACS
MATERIAL SAFETY DATA SHEET
NSN: 6810002229665
Manufacturer's CAGE: 59896
Part No. Indicator: A
Part Number/Trade Name: 88-4130(500G) POTASSIUM PERMANGANATE

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General Information

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Item Name: POTASSIUM PERMANGANATE,ACS
Company's Name: CAROLINA BIOGOLICAL SUPPLY CO
Company's Street: 2700 YORK RD
Company's City: BURLINGTON
Company's State: NC
Company's Country: US
Company's Zip Code: 27215-3387
Company's Emerg Ph #: 800-227-1150/910-584-0381(OUT SIDE)
Company's Info Ph #: 800-227-1150/910-584-0381(OUT SIDE)
Safety Data Action Code: A
Record No. For Safety Entry: 006
Tot Safety Entries This Stk#: 012 *
Status: SE
Date MSDS Prepared: 22JUL97
Safety Data Review Date: 27AUG98
Supply Item Manager: CX
MSDS Serial Number: CHQGZ
Specification Number: O-C-265
Hazard Characteristic Code: D1
Unit Of Issue: BT
Unit Of Issue Container Qty: 500 GRAMS
Type Of Container: BOTTLE
Net Unit Weight: 500 GRAMS

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Ingredients/Identity Information

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Proprietary: NO
Ingredient: POTASSIUM PERMANGANATE (SARA 313) (CERCLA)
Ingredient Sequence Number: 01
Percent: 90-100
Ingredient Action Code: A
NIOSH (RTECS) Number: SD6475000
CAS Number: 7722-64-7
OSHA PEL: C 5 MG(MN)/M3
ACGIH TLV: 5 MG(MN)/M3; 9596
Other Recommended Limit: NONE RECOMMENDED

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Physical/Chemical Characteristics

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Appearance And Odor: DARK PURPLE TO BRONZE CRYSTALS, ODORLESS
Boiling Point: NA
Melting Point: 302F,150C
Vapor Pressure (MM Hg/70 F): NA
Vapor Density (Air=1): 5.40
Specific Gravity: 2.70
Decomposition Temperature: NP
Evaporation Rate And Ref: NA

Solubility In Water: MODERATE(1-10%)

Percent Volatiles By Volume: 0

pH: NP

Corrosion Rate (IPY): NP

Autoignition Temperature: NA

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Fire and Explosion Hazard Data

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Flash Point: NA

Flash Point Method: NP

Lower Explosive Limit: NA

Upper Explosive Limit: NA

Extinguishing Media: USE DRY CHEMICAL, CO2 OR APPROPRIATE FOAM.

Special Fire Fighting Proc: FIREFIGHTERS SHOULD WEAR FULL PROTECTIVE EQPMT & NIOSH APPROVED SELF-CONTAINED BREATHING APPARATUS.

Unusual Fire And Expl Hazrds: CONTACT W/COMBUSTIBLE MATERIAL MAY CAUSE FIRE.STRONG OXIDIZER.CONTACT W/COMBUSTIBLE MATLS,FLAMM MATLS,OR POWDERED METALS CAN CAUSE FIRE OR EXPLOSION.

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Reactivity Data

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Stability: YES

Cond To Avoid (Stability): HEAT

Materials To Avoid: ORGANIC MATERIALS,COMBUSTIBLE MATERIALS,STRONG REDUCING AGENTS,STRONG ACIDS,PEROXIDES,ALCOHOLS,CHEMICALLY ACTIVE METALS.

Hazardous Decomp Products: NONE

Hazardous Poly Occur: NO

Conditions To Avoid (Poly): NOT APPLICABLE

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Health Hazard Data

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LD50-LC50 Mixture: ORAL RAT LD50:1090MG/KG

Route Of Entry - Inhalation: YES

Route Of Entry - Skin: NO

Route Of Entry - Ingestion: YES

Health Haz Acute And Chronic: HARMFUL IF SWALLOWED.EYE:MAY CAUSE IRRIT.

SKIN:MAY CAUSE IRRIT.INGEST:MAY CAUSE GASTROINTESTINAL DISCOMFORT.INHAL:MAY CAUSE IRRIT TO RESPIRATORY TRACT.CHRONIC:NONE.

Carcinogenicity - NTP: NO

Carcinogenicity - IARC: NO

Carcinogenicity - OSHA: NO

Explanation Carcinogenicity: PER MSDS:NOT LISTED AS CAUSING CANCER BY IARC/NTP/OSHA.

Signs/Symptoms Of Overexp: HARMFUL IF SWALLOWED.EYE/SKIN/RESP TRACT IRRIT.GI DISCOMFORT.

Med Cond Aggravated By Exp: EXCESSIVE INHAL IS IRRITATING,MAY CAUSE RESIRATORY SYSTEM,CENTRAL NERVOUS SYSTEM,BLOOD,KIDNEYS.

Emergency/First Aid Proc: EYE:FLUSH W/WATER FOR @LEAST 15MINS,RAISE/ LOWER EYELIDS OCCASIONALLY.IRRIT PERSISTS GET MED ATTN.SKIN:THOROUGHLY WASH EXPO AREA FOR @LEAST 15MINS.REMOVE CONTAM CLOTH.IRRIT PERSISTS GET MED ATTN.INGEST:IF CONSC GIVE PLENTY OF WATER,INDUCE VOMIT IMMED AS DIRECTED BY MED PERSONNEL.IMMED CALL DR/POIS CNTRL CNTR.UNCONSC NEVER GIVE ANYTHING BY MOUTH.INHAL:REMOVE TO FRESH AIR.BREATH DIFFI GIVE OXY;(SUPP)

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Precautions for Safe Handling and Use

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Steps If Matl Released/Spill: VENTILATE AREA OF SPILL.CLEANUP PERSONNEL

SHOULD WEAR PROPER PROTECTIVE EQPMT.AVOID CREATING DUST.SWEEP OR SCOOP UP & CONTAINERIZE FOR DISPOSAL.

Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.

Waste Disposal Method: EPA WASTE#:D001.DISPOSE IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL REGULATIONS.ALWAYS CONTACT PERMITTED WASTE DISPOSER(TSD)TO ASSURE COMPLIANCE.NO SARA/CERCLA/RCRA CHEMS.CERCLA SEC 103 RQ:MANGANESE COMPOUND 100LBS.

Precautions-Handling/Storing: KEEP CNTNR TIGHTLY CLOSED.STORE SEPARATELY AND AWAY FROM FLAMM AND COMBUSTIBLE MATLS.

Other Precautions: KEEP OUT OF REACH OF CHILDREN.

=====
Control Measures
=====

Respiratory Protection: NONE NEEDED UNDER NORMAL CONDITIONS OF USE W/ ADEQUATE VENTILATION.NIOSH APPROVED EQPMT SHOULD BE WORN IF PELS ARE EXCEEDED.

Ventilation: LOCAL EXHAUST:YES.MECHANICAL(GEN):YES.SPECIAL/OTHER:NO.

Protective Gloves: RUBBER,NEOPRENE,PVC OR EQUIVALENT

Eye Protection: SPLASH PROOF CHEM SAF GOGGLES @ALL TIMES

Other Protective Equipment: LAB COAT,EYE WASH,SAFETY SHOWER.

Work Hygienic Practices: LAUNDER CONTAMINATED CLOTHING BEFORE REUSE.

Suppl. Safety & Health Data: 1STAID:STOP BREATH GIVE ART RESP.KEEP PERSON WARM/QUIET.GET MED ATTN.

=====
Transportation Data
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Transportation Action Code: A

Trans Data Review Date: 98239

DOT PSN Code: MAU

DOT Proper Shipping Name: POTASSIUM PERMANGANATE

DOT Class: 5.1

DOT ID Number: UN1490

DOT Pack Group: II

DOT Label: OXIDIZER

IMO PSN Code: MFN

IMO Proper Shipping Name: POTASSIUM PERMANGANATE

IMO Regulations Page Number: 5173

IMO UN Number: 1490

IMO UN Class: 5.1

IMO Subsidiary Risk Label: -

IATA PSN Code: URW

IATA UN ID Number: 1490

IATA Proper Shipping Name: POTASSIUM PERMANGANATE

IATA UN Class: 5.1

IATA Label: OXIDIZER

AFI PSN Code: URW

AFI Prop. Shipping Name: POTASSIUM PERMANGANATE

AFI Class: 5.1

AFI ID Number: UN1490

AFI Pack Group: II

AFI Special Prov: P5

AFI Basic Pac Ref: A9.8

Additional Trans Data: PER MSDS:TRANSPO INFO-POTASSIUM PERMANGANATE,5.1,II, OXIDIZING AGENT, CORROSIVE.

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Disposal Data
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Label Data

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Label Required: YES
Technical Review Date: 27AUG98
Label Status: F
Common Name: 88-4130(500G) POTASSIUM PERMANGANATE
Chronic Hazard: NO
Signal Word: WARNING!
Acute Health Hazard-Slight: X
Contact Hazard-Moderate: X
Fire Hazard-None: X
Reactivity Hazard-Severe: X
RESP SYST,CNS,BLOOD,KIDNEYS.1ST AID:EYE:FLUSH W/WATER FOR @LEAST 15MINS,
THOROUGHLY WASH EXPO AREA FOR @LEAST 15MINS.REMOVE CONTAM CLOTH.IRRIT
PERSISTS GET MED ATTN.INGEST:IF CONSC GIVE PLENTY OF WATER,INDUCE VOMIT
IMMED AS DIRECTED BY MED PERSONNEL.IMMED CALL DR/POIS CNTRL CNTR.UNCONSC
NEVER GIVE ANYTHING BY MOUTH.INHAL:REMOVE TO FRESH AIR.BREATH DIFFI GIVE
OXY;STOP BREATH GIVE ART RESP.GET MED ATTN.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: CAROLINA BIOLOGICAL SUPPLY CO
Label Street: 2700 YORK RD
Label City: BURLINGTON
Label State: NC
Label Zip Code: 27215-3387
Label Country: US
Label Emergency Number: 800-227-1150\910-584-0381(OUT SIDE)
Year Procured: 1997

FERROSOURCE ENTERPRISES -- FERROUS SULFATE (IRON SULFATE HEPTAHYDRATE)
MATERIAL SAFETY DATA SHEET
NSN: 681000D010039
Manufacturer's CAGE: FERRO
Part No. Indicator: A
Part Number/Trade Name: FERROUS SULFATE (IRON SULFATE HEPTAHYDRATE)

=====

General Information

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Company's Name: FERROSOURCE ENTERPRISES, INC
Company's Street: 1785 CRESTON ST
Company's City: MUSKEGON
Company's State: MI
Company's Country: US
Company's Zip Code: 49442
Company's Emerg Ph #: 616-773-3321
Company's Info Ph #: 616-773-3321
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SE
Date MSDS Prepared: 01AUG91
Safety Data Review Date: 16JUN94
MSDS Serial Number: BTJSS
Specification Number: UNKNOWN
Spec Type, Grade, Class: UNKNOWN
Hazard Characteristic Code: J8
Unit Of Issue Container Qty: UNKNOWN
Type Of Container: UNKNOWN
Net Unit Weight: UNKNOWN

=====

Ingredients/Identity Information

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Proprietary: NO
Ingredient: FERROUS SULFATE (IRON SULFATE HEPTAHYDRATE)
Ingredient Sequence Number: 01
Percent: 100
NIOSH (RTECS) Number: 1011263FS
CAS Number: 7782-63-0
OSHA PEL: 1.0 MG/M3 (FE)
ACGIH TLV: 1.0 MG/M3 (FE)
Other Recommended Limit: NONE RECOMMENDED

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Physical/Chemical Characteristics

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Appearance And Odor: PALE GREEN CRYSTALS; ODORLESS. PH OF 1% SOLUTION=
2-5.
Boiling Point: 572F, 300C
Melting Point: 140F, 60C
Specific Gravity: 1.89
Decomposition Temperature: UNKNOWN
Evaporation Rate And Ref: UNKNOWN
Solubility In Water: APPRECIABLE
Corrosion Rate (IPY): UNKNOWN

=====

Fire and Explosion Hazard Data

=====

Flash Point: UNKNOWN

Lower Explosive Limit: UNKNOWN
Upper Explosive Limit: UNKNOWN
Extinguishing Media: NONE SPECIFIED BY MANUFACTURER. HMIS-MEDIA
APPROPRIATE FOR SURROUNDING FIRE.
Special Fire Fighting Proc: NONE SPECIFIED BY MANUFACTURER. HMIS-WEAR
SELF-CONTAINED BREATHING APPARATUS AND FULL BUNKER GEAR.
Unusual Fire And Expl Hazrds: NONE SPECIFIED BY MANUFACTURER.

=====

Reactivity Data

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Stability: YES
Cond To Avoid (Stability): NOT APPLICABLE
Materials To Avoid: NITRIC ACID, STRONG OXIDIZING AGENTS
Hazardous Decomp Products: SULFUR OXIDES
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT APPLICABLE

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Health Hazard Data

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LD50-LC50 Mixture: ORAL LD50 (RAT) IS UNKNOWN
Route Of Entry - Inhalation: NO
Route Of Entry - Skin: NO
Route Of Entry - Ingestion: NO
Health Haz Acute And Chronic: NONE SPECIFIED BY MANUFACTURER. HMIS-POISON
BY INTRAVENOUS, INTRAPERITONEAL & SUBCUTONEOUS ROUTES. MODERATLY TOXIC BY
INGESTION AND RECTAL ROUTES. MUTATION DATA REPORTED.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NO INGREDIENT OF A CONCENTRATION OF 0.1% OR
GREATER IS LISTED AS A CARCINOGEN OR SUSPECTED CARCINOGEN.
Signs/Symptoms Of Overexp: NONE SPECIFIED BY MANUFACTURER. HMIS-UNKNOWN.
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: NONE SPECIFIED BY MANUFACTURER. HMIS- GET
IMMEDIATE MEDICAL ATTENTION.

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Precautions for Safe Handling and Use

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Steps If Matl Released/Spill: SWEEP UP , MINIMIZING DUST. PLACE IN A DRY,
LABELED CONTAINER. FLUSH SPILL AREA WITH WATER AND DRAIN TO WASTE TREATMENT
SYSTEM.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: DRY-SANITARY LANDFILL. WET-DISSOLVE IN LARGE
AMOUNTS OF WATER & DRAIN TO SEWER OR LANDFILL. COMPLY WITH ALL LOCAL, STATE
AND FEDERAL REGULATIONS.
Precautions-Handling/Storing: KEEP CONTAINERS CLOSED WHEN NOT IN USE.
EMPTIED CONTAINERS RETAIN PRODUCT RESIDUE.
Other Precautions: NONE SPECIFIED BY MANUFACTURER.

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Control Measures

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Respiratory Protection: SINGLE FILTER RESPIRATOR WHERE DUSTING IS A
PROBLEM. HMIS- IF ENGINEERING CONTROLS FAIL OR EMERGENCY OCCURS; USE NIOSH/
MSHA APPROVED RESPIRATOR WITH DUST CARTRIDGE OR SCBA, AS REQUIRED. USE IAW
29 CFR 1910.134.
Ventilation: USE ADEQUATE MECHANICAL VENTILATION TO MAINTAIN MINIMUM DUST
LEVELS.

Protective Gloves: RUBBER OR OTHER IMPERVIOUS MATERIAL.
Eye Protection: SAFETY GOGGLES
Other Protective Equipment: AN EYE WASH STATION & SAFETY SHOWER SHOULD BE AVAILABLE.
Work Hygienic Practices: WASH HANDS AFTER USE AND BEFORE EATING, DRINKING, OR SMOKING. LAUNDRER CONTAMINATED CLOTHES BEFORE REUSE.
Suppl. Safety & Health Data: DLA HMIS STAFF HAD TO SIGNIFIGANTLY ENHANCE THIS MSDS ESPECIALLY IN SAFETY AND HEALTH; NONE GIVEN BY MFR. DLA-HMIS STAFFER USED DATA FOUND IN SAX.

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Transportation Data

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Trans Data Review Date: 94167
DOT PSN Code: LCR
DOT Symbol: AD
DOT Proper Shipping Name: OTHER REGULATED SUBSTANCES, SOLID, N.O.S.
DOT Class: 9
DOT ID Number: NA3077
DOT Pack Group: III
DOT Label: CLASS 9
IMO PSN Code: ZZZ
IMO Proper Shipping Name: NOT REGULATED FOR THIS MODE OF TRANSPORTATION
IATA PSN Code: SVI
IATA UN ID Number: 8027
IATA Proper Shipping Name: OTHER REGULATED SUBSTANCE +
IATA UN Class: 9
IATA Label: MISCELLANEOUS
AFI PSN Code: SVL
AFI Prop. Shipping Name: OTHER REGULATED SUBSTANCES
AFI Class: 9
AFI ID Number: ID8036
AFI Pack Group: III
AFI Basic Pac Ref: 13-14
N.O.S. Shipping Name: FERROUS SULFATE
Additional Trans Data: PSN FOR DOT IS PER MFR MSDS. NONE SUCH FOUND FOR IMO; DLA-HMIS STAFF ASSUMED THAT IATA/AFI WOULD FOLLOW DOT.

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Disposal Data

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Label Data

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Label Required: YES
Technical Review Date: 16JUN94
Label Status: F
Common Name: FERROUS SULFATE (IRON SULFATE HEPTAHYDRATE)
Chronic Hazard: NO
Signal Word: CAUTION!
Acute Health Hazard-Slight: X
Contact Hazard-None: X
Fire Hazard-None: X
Reactivity Hazard-None: X
Special Hazard Precautions: POISON BY INTRAVENOUS, INTRAPERITONEAL & SUBCUTONEOUS ROUTES. MODERATLY TOXIC BY INGESTION AND RECTAL ROUTES. MUTATION DATA REPORTED. KEEP CONTAINERS CLOSED WHEN NOT IN USE. EMPTIED CONTAINERS RETAIN PRODUCT RESIDUE. IN CASE OF SPILL: SWEEP UP, MINIMIZING DUST. PLACE IN A DRY, LABELED CONTAINER. FLUSH SPILL AREA WITH WATER AND

DRAIN TO WASTE TREATMENT SYSTEM. FIRST AID: GET IMMEDIATE MEDICAL
ATTENTION. TARGET ORGANS: NONE FOUND IN LITERATURE.

Protect Eye: Y

Protect Skin: Y

Label Name: FEROSOURCE ENTERPRISES, INC

Label Street: 1785 CRESTON ST

Label City: MUSKEGON

Label State: MI

Label Zip Code: 49442

Label Country: US

Label Emergency Number: 616-773-3321

FMC -- HYDROGEN PEROXIDE 20% STANDARD AND TECHNICAL GRADE
MATERIAL SAFETY DATA SHEET
NSN: 681000N049466
Manufacturer's CAGE: 93090
Part No. Indicator: A
Part Number/Trade Name: HYDROGEN PEROXIDE 20% STANDARD AND TECHNICAL GRADE
=====

General Information
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Company's Name: FMC CORP
Company's Street: 1735 MARKET STREET
Company's City: PHILADELPHIA
Company's State: PA
Company's Country: US
Company's Zip Code: 19103
Company's Emerg Ph #: 303-595-9048;800-424-9300 (CHEMTREC)
Company's Info Ph #: 609-924-6677
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 28JAN92
Safety Data Review Date: 02AUG95
MSDS Serial Number: BYGHP
=====

Ingredients/Identity Information
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Proprietary: NO
Ingredient: HYDROGEN PEROXIDE (SARA 302)
Ingredient Sequence Number: 01
Percent: 10
NIOSH (RTECS) Number: MX0900000
CAS Number: 7722-84-1
OSHA PEL: 1 PPM
ACGIH TLV: 1 PPM

Proprietary: NO
Ingredient: SUPP DATA: THE LIKELIHOOD OF CORR EFTS ON THE GI TRACT AFTER
INGEST & UNLIKELIHOOD OF SYSTEMIC EFTS, ATTEMPTS AT(ING 3)
Ingredient Sequence Number: 02
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 2: EVACUATING STOMACH VIA EMESIS INDUCTION/GASTRIC LAVAGE
SHOULD BE AVOIDED. THERE IS REMOTE POSSIBILITY, (ING 4)
Ingredient Sequence Number: 03
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 3: THAT A NASOGASTRIC OR OROGASTRIC TUBE MAY BE REQD FOR
REDUCTION OF SEV DISTENSION DUE TO GAS FORMATION.
Ingredient Sequence Number: 04
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE

ACGIH TLV: NOT APPLICABLE

Proprietary: NO

Ingredient: WASTE DISP METH: ACCEPTABLE METHODS OF DISP MAY VARY BY
LOCATION & BECAUSE REGULATORY REQS MAY CHANGE, THE APPROP(ING 6)

Ingredient Sequence Number: 05

NIOSH (RTECS) Number: 9999999ZZ

OSHA PEL: NOT APPLICABLE

ACGIH TLV: NOT APPLICABLE

Proprietary: NO

Ingredient: ING 5: REGULATORY AGENCIES SHOULD BE CONTACTED PRIOR TO
DISPOSAL.

Ingredient Sequence Number: 06

NIOSH (RTECS) Number: 9999999ZZ

OSHA PEL: NOT APPLICABLE

ACGIH TLV: NOT APPLICABLE

Proprietary: NO

Ingredient: OTHER PREC:PEROXIDE TO ORIGINAL CNTNR. EMPTY DRUMS SHOULD BE
RINSED W/WATER BEFORE DISCARDING. UTENSILS USED FOR (ING 8)

Ingredient Sequence Number: 07

NIOSH (RTECS) Number: 9999999ZZ

OSHA PEL: NOT APPLICABLE

ACGIH TLV: NOT APPLICABLE

Proprietary: NO

Ingredient: ING 7:HNDLG HYDROGEN PEROXIDE SHOULD BE MADE ONLY OF FOLLOWING
COMPATIBLE MATLS; GLASS, STAINLESS STEEL, ALUMINUM(ING 9)

Ingredient Sequence Number: 08

NIOSH (RTECS) Number: 9999999ZZ

OSHA PEL: NOT APPLICABLE

ACGIH TLV: NOT APPLICABLE

Proprietary: NO

Ingredient: ING 8:OR PLASTIC. STORAGE SHOULD CONFORM TO CONDITIONS
DESCRIBED IN NFPA BULLETIN 43A(CODE FOR STORAGE OF LIQUID(ING 10)

Ingredient Sequence Number: 09

NIOSH (RTECS) Number: 9999999ZZ

OSHA PEL: NOT APPLICABLE

ACGIH TLV: NOT APPLICABLE

Proprietary: NO

Ingredient: ING 9: AND SOLID OXYDIZING MATERIALS), NFPA HAZARD CLASS II
OXIDIZER.

Ingredient Sequence Number: 10

NIOSH (RTECS) Number: 9999999ZZ

OSHA PEL: NOT APPLICABLE

ACGIH TLV: NOT APPLICABLE

Proprietary: NO

Ingredient: OTHER PROT EQUIP:FULL COVER CLOTHING.

Ingredient Sequence Number: 11

Percent: N/A

NIOSH (RTECS) Number: 9999999ZZ

OSHA PEL: NOT APPLICABLE

ACGIH TLV: NOT APPLICABLE

Other Recommended Limit: NONE RECOMMENDED

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Physical/Chemical Characteristics

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Appearance And Odor: CLEAR COLORLESS LIQUID; ODORLESS.

Boiling Point: 217F, 103C

Melting Point: 6F, -14C

Vapor Pressure (MM Hg/70 F): 28 @ 30C

Specific Gravity: 1.07 (H₂O=1)

Evaporation Rate And Ref: 1 (BUAC=1)

Solubility In Water: 100

Percent Volatiles By Volume: 100

pH: SUPDAT

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Fire and Explosion Hazard Data

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Flash Point: NONCOMBUSTIBLE

Extinguishing Media: WATER, WATER FOG, CO₂, DRY CHEMICAL.

Special Fire Fighting Proc: WEAR NIOSH/MSHA APPRVD SCBA & FULL PROT EQUIP (FP N). ANY TANK/CNTNR SURROUNDED BY FIRE SHOULD BE FLOODED W/WATER FOR COOLING.

Unusual Fire And Expl Hazrds: HYDROGEN PEROXIDE ITSELF IS NONCOMBUSTIBLE. ON DECOMPOSITION, RELEASES OXYGEN WHICH MAY INTENSIFY FIRE.

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Reactivity Data

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Stability: NO

Cond To Avoid (Stability): EXCESS HEAT, CONTAM OF ANY KIND. IRON & OTHER HEAVY METALS, GALVANIZED IRON, COPPER ALLOYS, RUST, DIRT, ORGS & COMBUSTS. Materials To Avoid: REDUCING AGENTS, WOOD, PAPER & OTHER COMBUSTIBLES.

IRON & OTHER HEAVY METALS AS LISTED IN CONDITIONS TO AVOID.

Hazardous Decomp Products: OXYGEN WHICH SUPPORTS COMBUSTION.

Hazardous Poly Occur: NO

Conditions To Avoid (Poly): NOT RELEVANT.

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Health Hazard Data

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LD50-LC50 Mixture: LD50: (RAT) 1193 MG/KG

Route Of Entry - Inhalation: YES

Route Of Entry - Skin: NO

Route Of Entry - Ingestion: YES

Health Haz Acute And Chronic: ACUTE: CORROSIVE TO EYES & GI TRACT. MAY CAUSE IRREVERSIBLE TISS DMG TO EYES, INCLG BLINDNESS. SEVERELY IRRIT TO NOSE, THROAT & LUNGS. CHRONIC: THERE ARE REPORTS OF LIMITED EVID OF CARCIN OF HYDROGEN PEROXIDE TO MICE ADMIN HIGH CONCS IN THEIR DRINKING WATER (IARC MONO 36, 1985).

Carcinogenicity - NTP: NO

Carcinogenicity - IARC: NO

Carcinogenicity - OSHA: NO

Explanation Carcinogenicity: NOT RELEVANT.

Signs/Symptoms Of Overexp: SEE HEALTH HAZARDS.

Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.

Emergency/First Aid Proc: EYES: IMMED FLUSH W/LGE AMOUNTS OF WATER FOR AT LEAST 15 MINUTES, LIFTING UPPER & LOWER LIDS INTERMITTENTLY. SEE MD/ OPHTHALMOLOGIST. SKIN: WASH W/LGE AMOUNTS OF WATER. IF IRRIT PERSISTS, OBTAIN MED ATTN. INHAL: REMOVE TO FRESH AIR. CALL MD. INGEST: DRINK PLENTY OF WATER IMMEDIATELY TO DILUTE. DO NOT INDUCE VOMITING. SEE MD.

DECONTAMINATION PROCS: WASH AREA WITH LARGE AMOUNTS OF WATER. NOTE (SUPDAT)

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Precautions for Safe Handling and Use

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Steps If Matl Released/Spill: DILUTE W/LGE VOL OF WATER & HOLD IN POND/
DIKED AREA UNTIL H*2O*2 DECOMPOSES. DISPOSE OF ACCORDING TO METHODS
OUTLINED FOR DISPOSAL.

Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.

Waste Disposal Method: AN ACCEPTABLE METHOD OF DISP IS TO DILUTE W/LGE AMT
OF WATER & ALLOW HYDROGEN PEROXIDE TO DECOMP FOLLOWED BY DISCHARGE INTO
SUITABLE TREATMENT SYSTEM I/A/W ALL LOCAL, STATE & FEDERAL ENVIRON LAWS,
RULES, REGS, STANDARDS & OTHER REQS. BECAUSE(ING 5)

Precautions-Handling/Storing: WEAR CUP TYPE CHEM SAFETY GOGGS, POLYESTER/
ACRYLIC FULL COVER CLTHG & RUBBER/NEOPRENE GLOVES & SHOES. AVOID EXCESS
HEAT. AVOID CONTAMD OF ANY KIND.

Other Precautions: CONTAM MAY CAUSE DECOMP & GENERATION OF O*2 GAS WHICH
COULD RSLT IN HIGH PRESS & POSS CNTNR RUPTURE. HYDROGEN PEROXIDE SHOULD NOT
BE STORED IN UNVENTED CNTNR & SHOULD BE TRANS ONLY IN PRESCRIBED MANNER.
NEVER RETURN UNUSED HYDROGEN(ING 7)

=====

Control Measures

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Respiratory Protection: FOR SEVERE VAPOR OR MIST (CONCENTRATION IN EXCESS
OF 10 PPM) USE NIOSH/MSHA APPROVED SCBA. DO NOT USE OXIDIZABLE SORBANTS.

Ventilation: PROVIDE GENL & LOC EXHST VENT AS NEC. CONTROL MISTS IN WORK
AREA AT OR BELOW EXPOSURE GUIDELINES(TLV 1 PPM FOR 8 HRS).

Protective Gloves: LIQUID PROOF RUBBER/NEOPRENE GLOVES.

Eye Protection: ANSI APPRVD CHEM WORKERS GOGGS(FP N).

Other Protective Equipment: EMERG EYEWASH & DELUGE SHOWER WHICH MEET ANSI
DESIGN CRITERIA (FP N). RUB/NEOPRENE FOOTWEAR. POLYESTER/ACRYLIC (ING 11)

Work Hygienic Practices: NONE SPECIFIED BY MANUFACTURER.

Suppl. Safety & Health Data: PH: 2.5-3.5. FIRST AID PROC: TO MD: HYDROGEN
PEROXIDE AT THESE CONCS IS A STRONG OXIDANT. DIRECT CONTACT W/EYE IS
SUFFICIENTLY LIKELY TO CAUSE CORNEAL DMG, ESPECIALLY IF NOT WASHED AWAY
IMMED SO THAT CAREFUL OPHTHALMOLOGIC EVAL IS RECOMM & POSS OF LOC
CORTICOSTEROID THERAPY SHOULD BE CONSIDERED. BECAUSE OF (ING 2)

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Transportation Data

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Disposal Data

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Label Data

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Label Required: YES

Technical Review Date: 02AUG95

Label Date: 31JUL95

Label Status: G

Common Name: HYDROGEN PEROXIDE 20% STANDARD AND TECHNICAL GRADE

Chronic Hazard: NO

Signal Word: DANGER!

Acute Health Hazard-Moderate: X

Contact Hazard-Severe: X

Fire Hazard-None: X

Reactivity Hazard-None: X

Special Hazard Precautions: ACUTE: CORROSIVE TO EYES & GI TRACT. MAY CAUSE

IRREVERSIBLE TISS DMG TO EYES, INCLG BLINDNESS. SEVERELY IRRIT TO NOSE,
THROAT & LUNGS. CHRONIC: NONE SPECIFIED BY MANUFACTURER.

Protect Eye: Y

Protect Skin: Y

Protect Respiratory: Y

Label Name: FMC CORP

Label Street: 1735 MARKET STREET

Label City: PHILADELPHIA

Label State: PA

Label Zip Code: 19103

Label Country: US

Label Emergency Number: 303-595-9048;800-424-9300 (CHEMTREC)

HAWK CREEK LABS -- HYDROCHLORIC ACID - HYDROCHLORIC ACID,ACS
MATERIAL SAFETY DATA SHEET
NSN: 6810001450477
Manufacturer's CAGE: 61084
Part No. Indicator: A
Part Number/Trade Name: HYDROCHLORIC ACID

=====

General Information

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Item Name: HYDROCHLORIC ACID,ACS
Company's Name: HAWK CREEK LABS INC
Company's Street: RD 1 SIMPSON RD
Company's P. O. Box: 686
Company's City: GLEN ROCK
Company's State: PA
Company's Country: US
Company's Zip Code: 17327
Company's Emerg Ph #: 717-235-3849
Company's Info Ph #: 717-235-3849
Record No. For Safety Entry: 003
Tot Safety Entries This Stk#: 005
Status: SMJ
Date MSDS Prepared: 01MAR90
Safety Data Review Date: 25NOV91
Supply Item Manager: HX
MSDS Serial Number: BLMSR
Hazard Characteristic Code: C1
Unit Of Issue: BT
Unit Of Issue Container Qty: 16 OUNCES
Type Of Container: BOTTLE
Net Unit Weight: 1.2 LBS

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Ingredients/Identity Information

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Proprietary: NO
Ingredient: HYDROGEN CHLORIDE (HYDROCHLORIC ACID) (SARA III)
Ingredient Sequence Number: 01
Percent: 37
NIOSH (RTECS) Number: MW4025000
CAS Number: 7647-01-0
OSHA PEL: C 5 PPM
ACGIH TLV: C 5 PPM; 9192

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Physical/Chemical Characteristics

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Appearance And Odor: CLEAR, COLORLESS LIQUID WITH ACRID ODOR.
Boiling Point: 230F,110C
Melting Point: -101F,-74C
Vapor Density (Air=1): 1.25
Specific Gravity: 1.18
Solubility In Water: MISCIBLE

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Fire and Explosion Hazard Data

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Flash Point: NONFLAMMABLE
Extinguishing Media: DRY CHEMICAL.
Special Fire Fighting Proc: WEAR NIOSH/MSHA APPROVED SCBA AND FULL

PROTECTIVE EQUIPMENT (FP N).

Unusual Fire And Expl Hazrds: REACTS WITH MOST METALS TO FORM HYDROGEN GAS WHICH CAN FORM EXPLOSIVE MIXTURES WITH AIR.

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Reactivity Data
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Cond To Avoid (Stability): HEAT AND CONTACT WITH BASES, OXIDIZERS, AND METAL POWDERS.

Materials To Avoid: NONE SPECIFIED BY MANUFACTURER.

Hazardous Decomp Products: HCL GAS.

Conditions To Avoid (Poly): NONE SPECIFIED BY MANUFACTURER.
=====

Health Hazard Data
=====

LD50-LC50 Mixture: LD50:ORAL(RBT) 900 MG/KG

Route Of Entry - Inhalation: YES

Route Of Entry - Skin: YES

Route Of Entry - Ingestion: YES

Health Haz Acute And Chronic: CONTACT CAUSES PERMANENT DAMAGE TO EYES, SEVERE BURNS, AND ULCERATIONS ON SKIN. INHALATION OF VAPORS WILL DAMAGE RESPIRATORY TRACT.

Carcinogenicity - NTP: NO

Carcinogenicity - IARC: NO

Carcinogenicity - OSHA: NO

Explanation Carcinogenicity: NOT RELEVANT.

Signs/Symptoms Of Overexp: SEE HEALTH HAZARDS.

Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.

Emergency/First Aid Proc: EYES: FLUSH WITH WATER FOR AT LEAST 15 MIN; GET IMMED MED ASSISTANCE. SKIN: REMOVE CONTAMINATED CLOTHING AND WASH WITH SOAP AND WATER. INHAL: MOVE TO FRESH AIR AND GIVE ARTF RESP IF BREATHING HAS STOPPED. INGEST: DO NOT INDUCE VOMITING. GIVE MILK OR WATER IF CONSCIOUS. GET IMMED MED ATTN. GET MED ASSISTANCE FOR ALL CASES OF OVEREXPOSURE.
=====

Precautions for Safe Handling and Use
=====

Steps If Matl Released/Spill: NEUTRALIZE WITH SODA ASH, ABSORB WITH SAND OR VERMICULITE AND SCOOP UP AND CONTAINERIZE FOR PROPER DISPOSAL.

Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.

Waste Disposal Method: COMPLY WITH ALL LOCAL, STATE AND FEDERAL REGULATIONS.

Precautions-Handling/Storing: KEEP CONTR TIGHTLY CLSD. STORE IN COOL, DRY/ WELLVENTD AREA. KEEP AWAY FROM IGNIT SOURCE. WASH THORO AFTER HNDLG. EMPTY CONTR MAY BE HAZ DUE TO(SUPDAT

Other Precautions: DO NOT GET IN EYES, ON SKIN OR CLOTHING. DO NOT BREATHE VAPORS OR MIST.
=====

Control Measures
=====

Respiratory Protection: WEAR NIOSH/MSHA APPROVED SCBA IN HIGH VAPOR AREAS.

Ventilation: PROVIDE ADEQUATE GENERAL AND LOCAL EXHAUST VENTILATION.

Protective Gloves: IMPERVIOUS GLOVES (FP N).

Eye Protection: CHEM WORK GOG W/FULL LENGTH FSHLD(FP N).

Other Protective Equipment: EMERGENCY EYEWASH AND DELUGE SHOWER (FP N).

Work Hygienic Practices: WASH THOROUGHLY AFTER HANDLING.

Suppl. Safety & Health Data: HNDLG/STOR PREC: RETAINED RESIDUE.
=====

Transportation Data

=====
Trans Data Review Date: 92006
DOT PSN Code: HJG
DOT Proper Shipping Name: HYDROCHLORIC ACID, SOLUTION
DOT Class: 8
DOT ID Number: UN1789
DOT Pack Group: II
DOT Label: CORROSIVE
IMO PSN Code: IEX
IMO Proper Shipping Name: HYDROCHLORIC ACID
IMO Regulations Page Number: 8183
IMO UN Number: 1789
IMO UN Class: 8
IMO Subsidiary Risk Label: -
IATA PSN Code: NPG
IATA UN ID Number: 1789
IATA Proper Shipping Name: HYDROCHLORIC ACID
IATA UN Class: 8
IATA Label: CORROSIVE
AFI PSN Code: NPG
AFI Symbols: T
AFI Prop. Shipping Name: HYDROCHLORIC ACID, SOLUTION
AFI Class: 8
AFI ID Number: UN1789
AFI Pack Group: II
AFI Special Prov: A3,A6,N41
AFI Basic Pac Ref: 12-5
=====

=====
Disposal Data
=====

=====
Label Data
=====

Label Required: YES
Technical Review Date: 25NOV91
Label Date: 28OCT91
Label Status: G
Common Name: HYDROCHLORIC ACID
Signal Word: DANGER!
Acute Health Hazard-Severe: X
Contact Hazard-Severe: X
Fire Hazard-Slight: X
Reactivity Hazard-None: X
Special Hazard Precautions: ACUTE: COMBUSTIBLE. INHALATION WILL DAMAGE
RESPIRATORY TRACT. CONTACT CAUSES PERMANENT DAMAGE TO EYES, SEVERE BURNS,
AND ULCERATIONS ON SKIN. CHRONIC EFFECTS: NONE LISTED BY MFR.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: HAWK CREEK LABS INC
Label Street: 686 SIMPSON RD
Label P.O. Box: RD 1
Label City: GLEN ROCK
Label State: PA
Label Zip Code: 17327
Label Country: US
Label Emergency Number: 717-235-3849

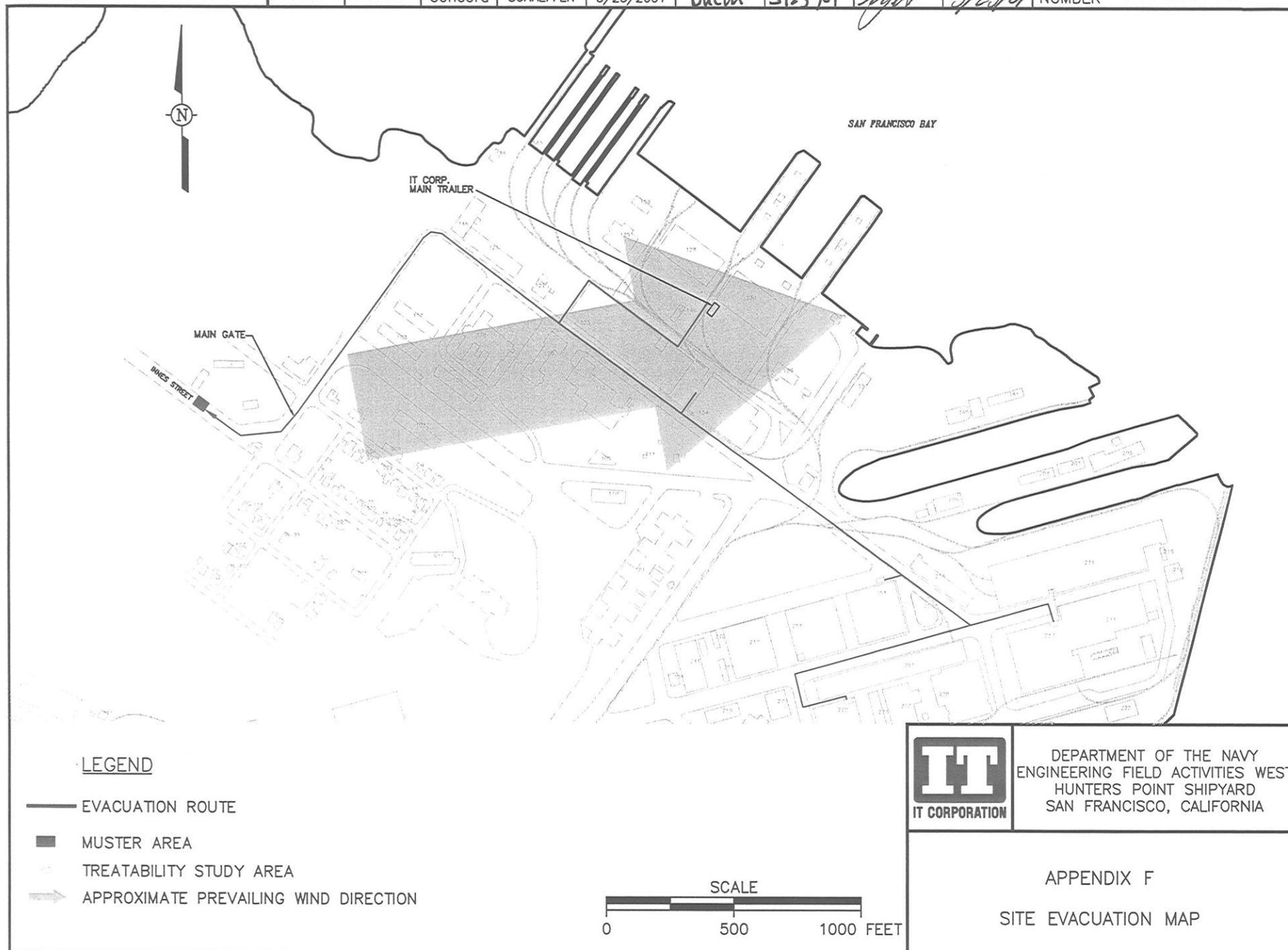
APPENDIX E HEALTH AND SAFETY CHECKLIST

Health and Safety Checklist

<input type="checkbox"/>	First aid kits (one per vehicle and CRZ)	<input type="checkbox"/>	Signed Site-Specific Health and Safety Plan
<input type="checkbox"/>	A/B/C Fire extinguishers (one per vehicle)	<input type="checkbox"/>	Rubber boots/boot covers
<input type="checkbox"/>	Water Fire Extinguishers (two chemical area, and one per EZ)	<input type="checkbox"/>	Sun block
<input type="checkbox"/>	Safety glasses or goggles, ANSI approved	<input type="checkbox"/>	Shade
<input type="checkbox"/>	Hard hats, ANSI approved	<input type="checkbox"/>	Polyethylene sheeting (10-mil thickness)
<input type="checkbox"/>	Ear plugs, 25 dBA or greater	<input type="checkbox"/>	55-gallon drums
<input type="checkbox"/>	Under gloves (latex, Nitrile)	<input type="checkbox"/>	Hach spectrophotometer
<input type="checkbox"/>	Rubber over gloves	<input type="checkbox"/>	Plastic bags
<input type="checkbox"/>	Leather work gloves	<input type="checkbox"/>	Isobutylene calibration gas
<input type="checkbox"/>	Steel-toed work boots, ANSI approved	<input type="checkbox"/>	Tedlar bags
<input type="checkbox"/>	PVC-coated Tyvek suits (sizes XXL – XXXXL)	<input type="checkbox"/>	Air horn
<input type="checkbox"/>	Duct tape	<input type="checkbox"/>	Noise Dosimeter/sound level meter with calibrator
<input type="checkbox"/>	Trash bags	<input type="checkbox"/>	Traffic control vests, bright color/reflective
<input type="checkbox"/>	Eyewash	<input type="checkbox"/>	Wet Bulb Globe Thermometer (WBGT)
<input type="checkbox"/>	Emergency shower	<input type="checkbox"/>	Barricades with lights
<input type="checkbox"/>	Hand/face wash station	<input type="checkbox"/>	Traffic cones
<input type="checkbox"/>	Paper towels	<input type="checkbox"/>	Personal sampling pump
<input type="checkbox"/>	Drinking water and disposable cups	<input type="checkbox"/>	Pulse rate meter
<input type="checkbox"/>	Absorbent pads	<input type="checkbox"/>	Air flow calibrator
<input type="checkbox"/>	Air-purifying respirators (full-face)	<input type="checkbox"/>	PVC raingear
<input type="checkbox"/>	Organic vapor/HEPA cartridges, NIOSH approved	<input type="checkbox"/>	Detector tubes – (TCE, PCE, TCA, VC, HS and HCl)
<input type="checkbox"/>	Thermometer	<input type="checkbox"/>	Deager pump
<input type="checkbox"/>	Barricade tape (yellow and red)	<input type="checkbox"/>	Methane calibration gas
<input type="checkbox"/>	O ₂ LEL meter	<input type="checkbox"/>	10% sodium bisulfite solution (two units, each a 5 gallon Hudson sprayer)
<input type="checkbox"/>	Photoionization detector (PID)	<input type="checkbox"/>	Small spray bottle (two units consisting of 1/3 each household vinegar, peroxide, and water solutions)
<input type="checkbox"/>	Miniram aerosol monitor	<input type="checkbox"/>	Ear muffs/ear plugs
<input type="checkbox"/>	Decon tubs	<input type="checkbox"/>	Sodium bicarbonate (baking soda)
<input type="checkbox"/>	Portable lighting	<input type="checkbox"/>	Brushes
<input type="checkbox"/>	MSDSs (KMnO ₄ , H ₂ O ₂ , FeSO ₄ , NaHSO ₃ , HCl)	<input type="checkbox"/>	

APPENDIX F SITE EVACUATION MAP

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	---	Concord	SCHAEFFER 3/23/2001	Ducm 3/23/01	<i>[Signature]</i> 3/23/01	819828-A44



APPENDIX G

SITE AND HOSPITAL ROUTE MAPS

819828-B18
DRAWING
NUMBER

APPROVED BY
3/23/01

CHECKED BY
3/23/01

DRAWN BY
2/6/1

OFFICE
CONCORD

X-REF

IMAGE

SAN FRANCISCO
BAY

APPROXIMATE
LOCATION OF
LANDFILL

E

A

B

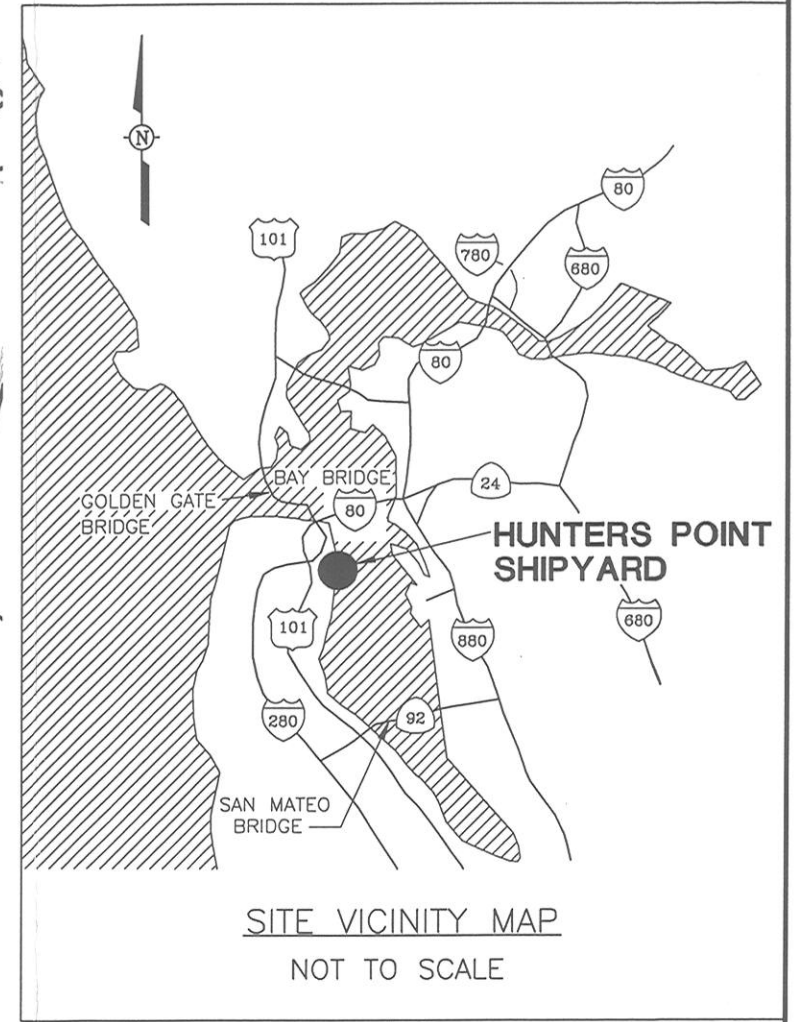
C

D

SCALE
0 500 1000 FEET

EXPLANATION

PARCEL BOUNDARY



SITE VICINITY MAP
NOT TO SCALE

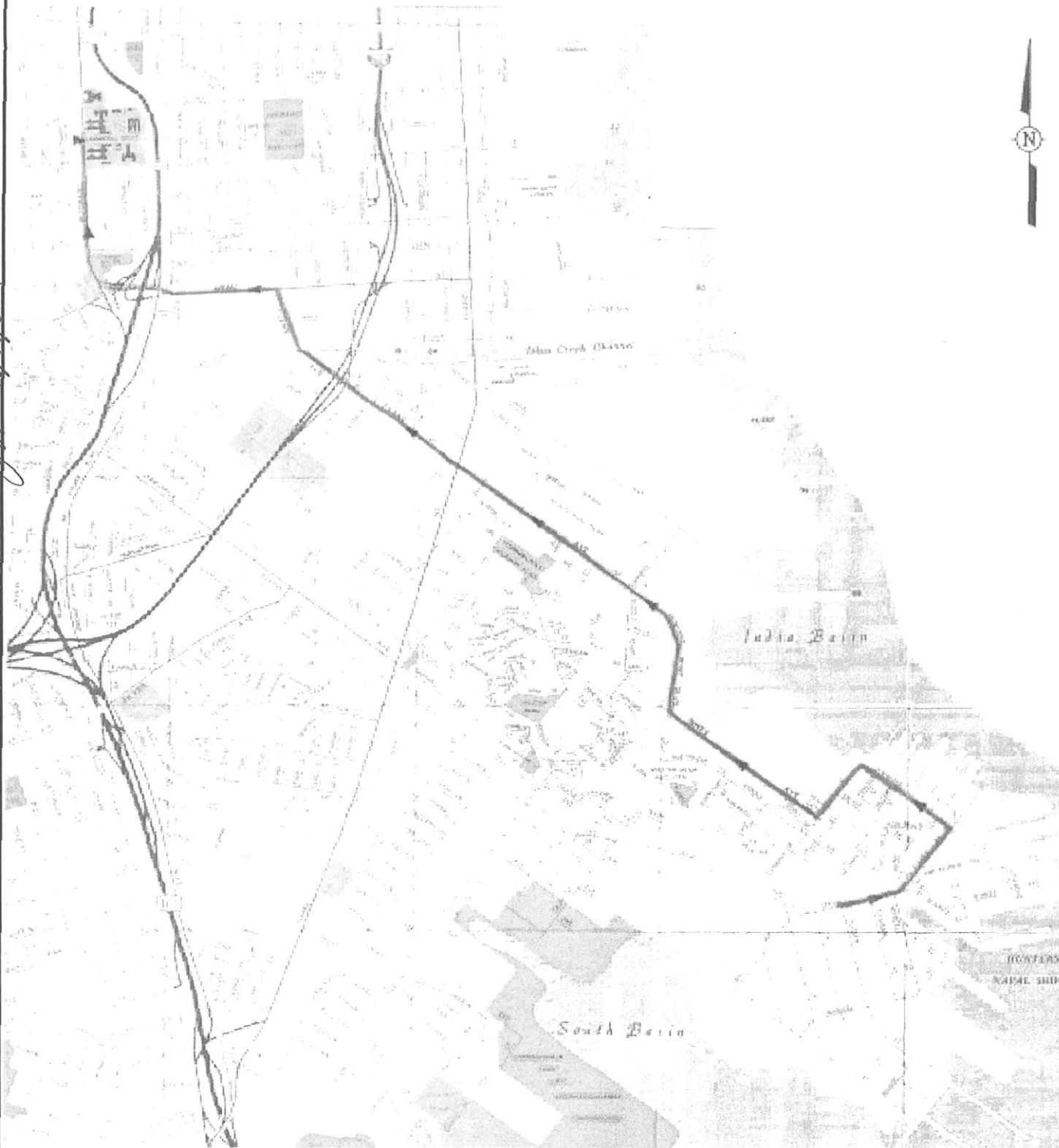


HUNTERS POINT SHIPYARD
SAN FRANCISCO, CALIFORNIA

APPENDIX G

SITE MAP
LANDFILL LOCATION

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	---	Concord	SJZ 01/04/01	3/23/01	3/23/01	819828-A42



NOT TO SCALE

DIRECTIONS TO SAN FRANCISCO GENERAL HOSPITAL:

FROM THE SECURITY GATE AT DONAHUE ST. AND INNES AVE., TAKE INNES AVE. NORTH. TURN RIGHT ON HUNTERS POINT BLVD. WHICH EVENTUALLY BECOMES EVANS AVE. FOLLOW EVANS AVE. UNTIL ITS END AT ARMY ST. TURN LEFT ON ARMY ST. AND GO PAST HIGHWAY 101. JUST PAST HIGHWAY 101, TURN RIGHT ON POTRERO AVE. CONTINUE ON POTRERO AVE. TO THE HOSPITAL WHICH IS AT 22ND ST. AND POTRERO AVE.

TELEPHONE NUMBER (415) 206-8000



HUNTERS POINT SHIPYARD
SAN FRANCISCO, CALIFORNIA

APPENDIX G

HOSPITAL ROUTE
PARCELS C AND D

APPENDIX H

EMERGENCY RESPONSE PROCEDURES FOR CHEMICAL SPILLS

FINAL
EMERGENCY RESPONSE PROCEDURES FOR CHEMICAL SPILLS
CHEMICAL OXIDATION TREATABILITY STUDIES, REMEDIAL UNITS 2, 4, 5, AND 6 AT PARCEL C
HUNTERS POINT SHIPYARD
SAN FRANCISCO, CALIFORNIA

Contract No. N62474-98-D-2076
Contract Task Order 0030

Document Control Number 1171
Revision 0

March 26, 2001

Submitted to:

U.S. Department of the Navy
Southwest Division
Naval Facilities Engineering Command
Environmental Division
1220 Pacific Highway
San Diego, California 92132

Submitted by:

IT Corporation
4005 Port Chicago Highway
Concord, California 94520

Hydrogen Peroxide (H₂O₂) Emergency Response Procedures

A. This procedure is applicable to spills, leaks, etc. of the H₂O₂ within the chemical storage area or the remedial unit.

1. Clear personnel from the spill area to avoid expanding the affected area.
2. Don protective face shield, safety glasses, chemical-resistant clothing (coated Tyvek coveralls, rubber overboots and neoprene gloves).
3. Contain spill with non-combustible materials (pigs, hogs, soil, etc.); isolate spill from segregated portions of the chemical storage area.
4. Dilute spill with large volumes of water (10:1, ten parts water to each part concentrated H₂O₂); hold diluted H₂O₂ solution in the contained area for decomposition of the H₂O₂ to occur. Hydrogen peroxide decomposes rapidly (within a couple of hours) in the presence of sunlight. Proper disposal of the inactive, dilute solution will be determined on-site.

If personnel are exposed to hydrogen peroxide, consult the H₂O₂ MSDS for first aid procedures.

Ferrous Sulfate (FeSO₄) Emergency Response Procedures

A. This procedure is applicable to spills of FeSO₄ (solid) within the chemical storage area.

1. Clear personnel from the spill area to avoid expanding the affected area.
2. Don protective face shield, or safety glasses, chemical-resistant clothing (coated Tyvek coveralls, rubber overboots and neoprene gloves), and air-purifying respirator (APR).
3. Conduct dry sweep of the spilled material.
4. Place collected materials in a waste bag or container for disposal per local requirements.
5. Conduct wet sweep of area after bulk chemical has been removed.
6. Containerize the liquids for disposal off-site.

B. This procedure is applicable to spills of acidified- FeSO₄ (solution) within the remedial unit.

1. Clear personnel from the spill area to avoid expanding the affected area.
2. Don protective face shield, or safety glasses, chemical-resistant clothing (coated Tyvek coveralls, rubber boots and neoprene gloves).
3. Contain spill with non-combustible materials (pigs, hogs, soil, etc.). Isolate spill from segregated portions of the remedial unit, to prevent chemical mixing.

4. Dilute 10:1 with water and neutralize with sodium bicarbonate.
5. Containerize the spill for disposal off-site.

If personnel are exposed to ferrous sulfate, consult with FeSO₄ MSDS for first aid procedures.

Sodium Bisulfate (NaHSO₃) Emergency Response Procedures

A. This procedure is applicable to spills of NaHSO₃ (solid) within the chemical storage area.

1. Clear personnel from the spill area to avoid expanding the affected area.
2. Don protective face shield, or safety glasses, chemical-resistant clothing (coated Tyvek coveralls, rubber boots and APR).
3. Conduct dry sweep of the spilled material.
4. Place collected materials in a waste bag or container for off-site disposal.
5. Conduct wet sweep of area after bulk chemical has been removed. Neutralize wet sweep fluids by the procedure below.

B. This procedure is applicable to spills of NaHSO₃ (solution) within the remedial unit.

1. Clear personnel from the spill area to avoid expanding the affected area.
2. Don protective face shield, or safety glasses, chemical-resistant clothing (coated Tyvek coveralls, rubber boots and neoprene gloves) and APR.
3. Contain spill with non-combustible materials (pigs, hogs, soil, etc.). Isolate spill from segregated portions of the remedial unit, to prevent chemical mixing.
4. Dilute spill with water (approximately a 10:1 dilution, 10 parts of water to each part of NaHSO₃ solution). Collect sample and determine solution of pH with on-site instrumentation.
5. Neutralize the solution within range of pH 6.5 to 7.5 by adding sodium bicarbonate (baking soda).
6. Containerize the spilled, diluted, and neutralized solution for disposal off-site.

If personnel are exposed to sodium bisulfate, consult the NaHSO₃ MSDS for first aid procedures.

Hydrochloric Acid (HCl) Emergency Response Procedures

A. This procedure is applicable to spills of concentrated HCl (solution) within the chemical storage area or the remedial unit.

1. Clear personnel from the spill area to avoid expanding the affected area.

2. Don protective face shield, or safety glasses, chemical-resistant clothing (coated Tyvek coveralls, rubber boots and neoprene gloves).
3. Contain spill with non-combustible materials (pigs, hogs, soil, etc.). Isolate spill from segregated portions of the remedial unit to prevent chemical mixing.
4. Dilute spill with water (approximately a 10:1 dilution, 10 parts of water to each part of HCl solution). Collect sample and determine solution pH with on-site instrumentation.
5. Neutralize the solution to within range of pH 6.5 to 7.5 by adding sodium bicarbonate (baking soda). Collect sample and determine solution pH with on-site instrumentation.
6. Adsorb with neutral solution with sand or vermiculite.
7. Containerize the spilled, diluted, and neutralized solution for disposal off-site.

If personnel are exposed to hydrochloric acid, consult the HCl MSDS for first aid procedures.

Potassium Permanganate (KMnO₄) Emergency Response Procedures

A. This procedure is applicable to spills of KMnO₄ (solid) within the chemical storage area.

1. Clear personnel from the spill area to avoid expanding the affected area.
2. Don protective face shield, or safety glasses, chemical-resistant clothing (coated Tyvek coveralls, rubber boots and neoprene gloves) and APR.
3. Conduct dry sweep of the spilled material.
4. Place collected materials in a waste bag or container for disposal at the county landfill.
5. Contain spill with non-combustible materials (pigs, hogs, soil, etc.). Isolate spill. Conduct wet sweep of area after the bulk chemical has been removed. Neutralize wet sweep fluids by the procedure below.

B. This procedure is applicable to spills of KMnO₄ (solution) within the remedial unit.

1. Clear personnel from the spill area to avoid expanding the affected area.
2. Don protective face shield, or safety glasses, chemical-resistant clothing (coated Tyvek coveralls, rubber boots and neoprene gloves).
3. Contain spill with non-combustible materials (pigs, hogs, soil, etc.). Isolate spill from segregated portions of the remedial unit, to prevent chemical mixing.
4. Dilute spill with water to a concentration of <10g/L (approximately 3:1 dilution, 3 parts of water to each part of KMnO₄ solution, from the designed KMnO₄

injection concentration). Collect sample and verify proper dilution using on-site analysis by Hach spectrophotometer. Hold diluted KMnO_4 solution for neutralization.

5. Neutralize the dilute KMnO_4 solution with a 10% solution of sodium bisulfate (NaHSO_3). Add the NaHSO_3 solution with mixing (if possible) until the solution turns brown indicating neutralization is complete.
6. Containerize the spilled, diluted, and neutralized solution for disposal off-site.

If personnel are exposed to potassium permanganate, consult the KMnO_4 MSDS for first aid procedures.